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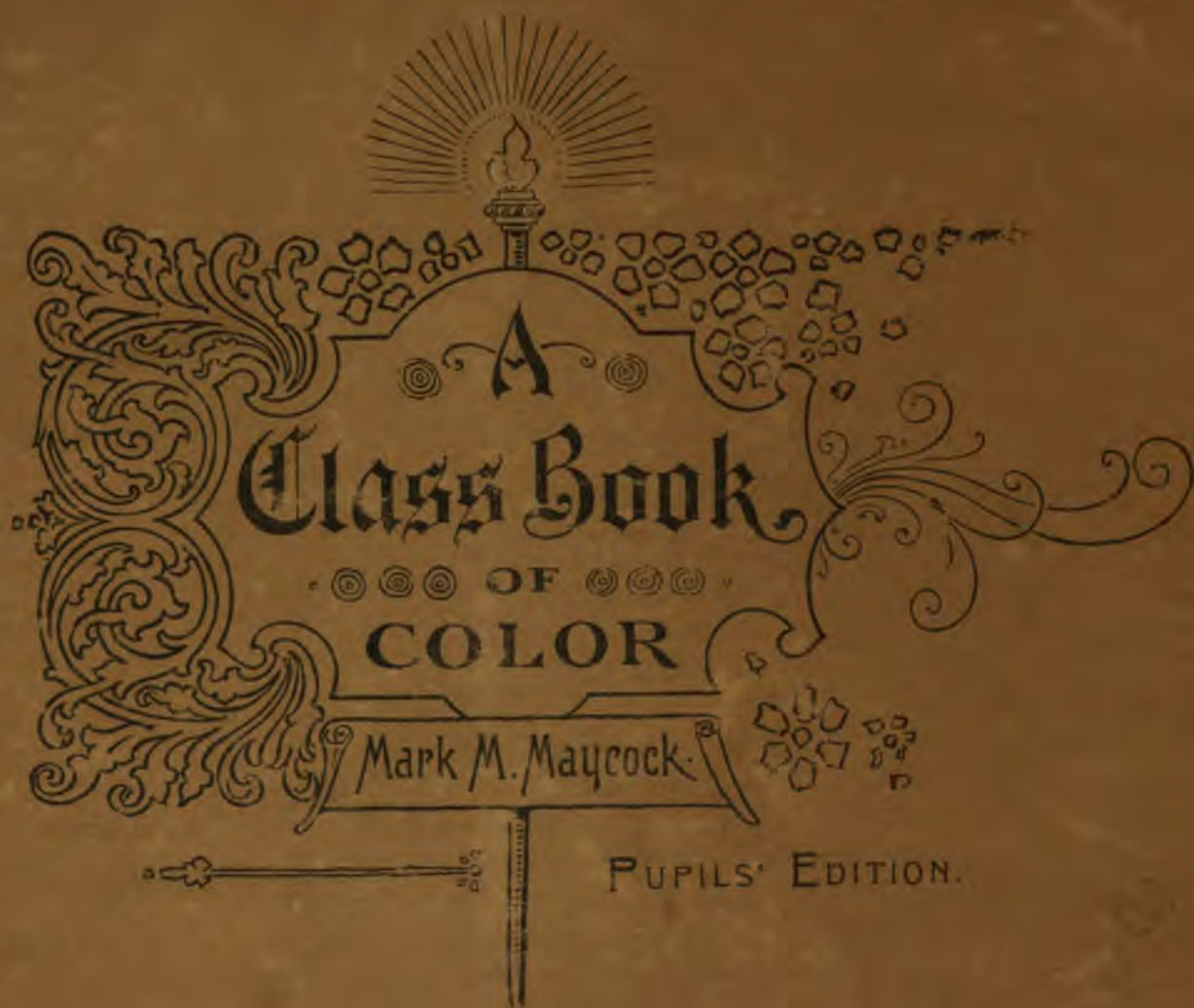
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A
CLASS-BOOK OF COLOR;

INCLUDING

COLOR DEFINITIONS, COLOR SCALING,

AND

THE HARMONY OF COLORS,

BY

MARK M. MAYCOCK, M. P.,

STATE NORMAL SCHOOL, BUFFALO, N. Y.

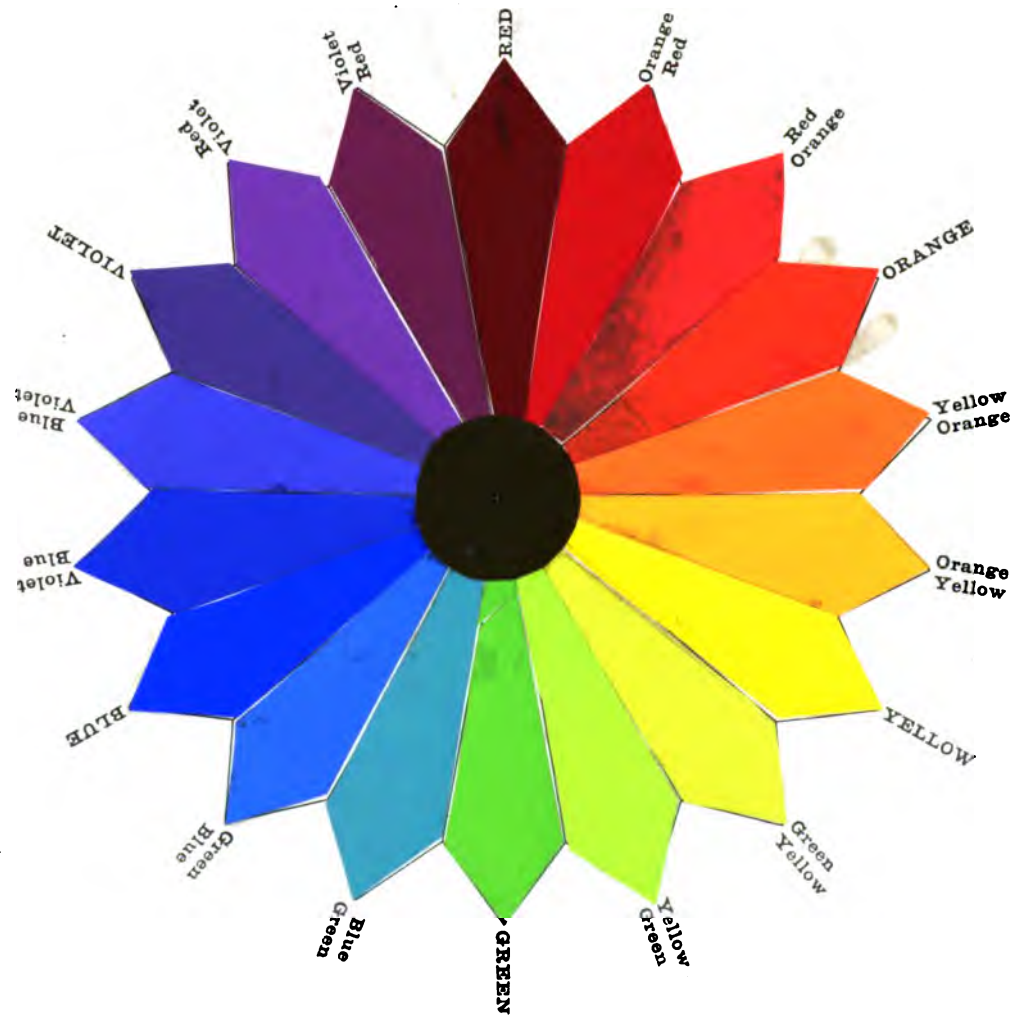
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Scale of Normal Colors and their Hues.

GENERAL DIRECTIONS.

After learning the definitions,
the work in this book should begin on
page 10; the mounting of the colors in the given
spaces on the pages preceding page 10 may be omitted, or the
scaling may be done when the corresponding steps in the study of the
colors are reached. The folded and cut squares are to be
mounted upon the printed patterns, and drawn
in the space below. The book is arranged
for the Milton Bradley Co.'s colors.

CONTENTS.

	PAGE
General Directions,	4
Materials Needed by each Pupil,	6
Definitions,	7-13
The Theory of Color,	7
Scaling Colors,	11
Paper Folding,	15-39
Normal Colors,	15-19
Scale of the Normal Colors,	21
Tints of the Normal Colors,	23-27
Shades of the Normal Colors,	29-33
Scale of Tones of the Normal Colors,	35
Hues of the Normal Colors,	37-47
Harmony of Colors,	49
Harmonies of Analogous Colors,	49
Harmonies of Contrasts,	49
Simultaneous Contrast,	50-51
Contrast of Tone,	51
Contrast of Hue,	51
Successive Contrast,	52
Mixed Contrast,	52
CONTRASTED HARMONY,	53
DOMINANT HARMONY,	54
COMPLEMENTARY HARMONY,	56
Scale of Complementary Contrasts,	57
Contrasting Colors,	59
ANALOGOUS HARMONY,	60
PERFECTED HARMONY,	62
Suggestions for Illustrating the Harmonies of Colors,	63
Combinations for Illustrating the Harmonies of Colors,	64
Colors Used in the Different Styles of Ornament,	65
Sections by which to mark out the Designs,	67
For Illustrations of the Harmonies,	69-77

MATERIALS NEEDED BY EACH PUPIL.

To accomplish all the work planned in this book the following named colors will be needed, cut two and one-half inches square:

6 squares of each of the normal colors.

3 squares of each of the tints of the normal colors.

3 squares of each of the shades of the normal colors.

3 squares of each of the hues.

1 square of each of the tints of the hues.

1 square of each of the shades of the hues.

3 squares of black.

3 squares of gray.

A few strips of gold and a few of silver paper, to use in the harmonies of the colors.

The gold and silver paper are best bought in sheets and cut into strips or tablets as needed.

The tints and the shades of the colors used on pages 23 to 33 should be those next to the normal colors in intensity.

A pair of scissors.

A pencil.

Liquid glue, thick mucilage or paste, glue being much the most satisfactory. The glue may be applied to the back of the patterns, either with the point of a toothpick or with the end of a finger; but in whatever way it is applied, the touch should not be larger than a pin's head, and no more of these touches should be put on one pattern than are necessary to keep it evenly in its place.

The designs to illustrate the harmonies of colors may be secured in place by covering the entire back of each tablet with the glue, or paste, if preferred; but if they are mounted in this way, extra care must be taken to avoid smearing or defacing the front of the tablet.

COLOR.

Definition. Color is a visual sensation, caused by waves of incomplete light acting upon the eye.

Cause of color. Most objects have the property of reflecting certain rays of light and absorbing all others. The color of an object is the remaining portion of white light after the abstraction of those rays which are extinguished by absorption.

Source of color. Light is the source of all colors, and where there is no light there is no color; an effect of color is, however, sometimes produced by unduly exciting the optic nerve, either by electricity, pressure, or a blow upon the eye. In teaching color we have nothing to do with this phenomenon, as it belongs entirely to the realm of the physicist.

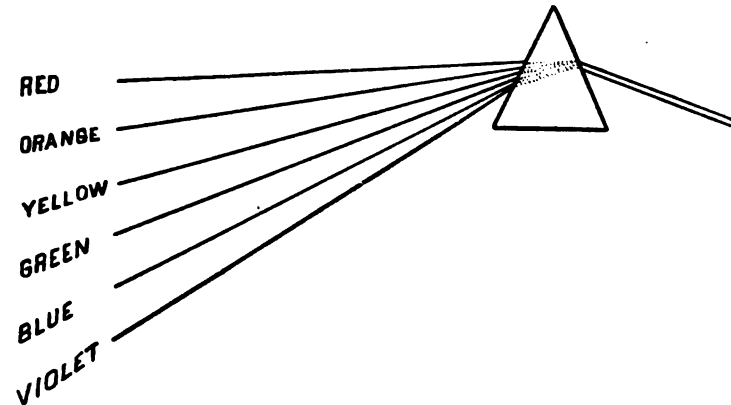
Light. Light is a vibratory wave motion of a medium called *ether*, which fills all space. Its motion is similar to that caused by throwing a stone into a pond, only the waves of light are infinitely small and of short duration, there being for red about 39,000 of them in the space of an inch, and about 667 trillions of them are executed in a second of time. "These waves break upon the surface of the retina and cause the sensation of sight."

Ray of light. A *ray* of light is a small linear portion of light. It may be of any color.

Beam of light. A *beam* of light is a linear portion of light composed of a number of rays.

Prismatic colors.

White light, that is, sunlight, is composed of various colors, as is easily shown by placing a prism in the path of a small beam of sunlight. The prism separates the different colors that compose white light, and produces what is known as the *prismatic* or *solar spectrum*, as shown in the illustration.



These colors are the same, and their arrangement is in the same order, as in the rainbow.

Objects have no color in themselves, but they possess the power of reflecting waves of light; and it is the waves of light of varying lengths that give us the effect of color.

It is the amount of motion of the ether, or height of the wave, that produces the intensity or brightness of the light, and the length of the wave that produces the color; thus red has a wave length of about $\frac{7000}{1000000000}$ of an inch, orange $\frac{5875}{1000000000}$, yellow $\frac{5800}{1000000000}$, green $\frac{5375}{1000000000}$, blue $\frac{4750}{1000000000}$, and violet $\frac{4000}{1000000000}$.

Since the different kinds of light are transmitted with equal velocity, violet light makes more vibrations in the same length of time than red light.

Colors of objects. The colors of objects are due to the power they possess of absorbing certain portions of the colored rays that make up a beam of white light and reflecting others; thus, an object is red because it reflects the red rays only and absorbs the others; a yellow object reflects only the yellow rays; the same with the other colors. The rays that are absorbed are changed into heat.

White and black. A white substance reflects all the rays that constitute white light, while a black object absorbs them all. It is not known what causes a substance to reflect a certain color and to absorb others.

Colors in nature. "Very few objects have a color which exactly corresponds to any color of the spectrum. This is found to result from the fact that most bodies, while they reflect some one color chiefly, reflect the others in some degree. A red flower reflects the red light abundantly, and perhaps some rays of all the other colors with red. Hence there may be as many different reds as there can be different proportions of the other colors mingled with it. The same is true of each color of the spectrum."

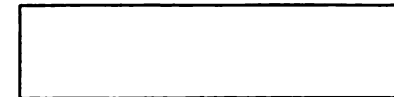
Classifying colors. There are two general ways of classifying colors, one is from the artists' standpoint, in which the various colors are considered as pigments, and the other is from the scientific side, in which they are treated as elements of white light.

Primary, secondary and tertiary colors. Artistically considered, there are three primary colors, Red, Blue and Yellow, and all other colors are produced by the admixture of these three. There are also three secondary colors, Orange, Green and Violet or Purple, which are produced by the mixture of two of the primaries. Thus Red and Blue produce Violet, Red and Yellow make Orange, and Blue and Yellow give Green.

The mixture of the secondary colors give three other colors called tertiaries. These are Citrine, Olive and Russet.

Citrine is made by mixing Orange and Green, Olive by mixing Purple and Green, and Russet by mixing Orange and Purple.

Normal standards. Treated scientifically, the six colors of the spectrum are taken as normal or primary colors, and all variations in tints, shades and hues are considered as modifications or variations of these six normal colors. In these lessons the six spectrum colors, as shown below, are taken as normal standards.



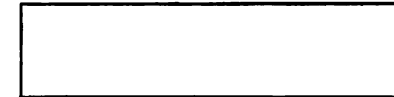
RED.



ORANGE.



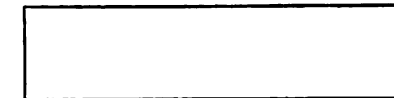
YELLOW.



GREEN.



BLUE.



VIOLET.

The colors of objects are expressed in terms that by common usage have become of fixed value.

Normal color. A *normal color* is a prismatic, primitive and pure color. It is the basis from which *tints*, *shades* and *hues* are determined. There are six of these normal colors, viz : Red, Orange, Yellow, Green, Blue. and Violet.

Different names for normal color. The normal colors are referred to by different writers as Standard colors, Spectral colors, Positive colors, Pure colors, Full colors, and Saturated colors. The name Normal is, however, preferred, because it expresses the normal or natural condition of the color when unaffected by light, shade or other colors.

A standard color, may be any color that is accepted as the typical color of a series, as a standard gray, which is produced by mixing a black with a white pigment ; a standard straw color, which is judged from a straw color accepted as a standard. There may be any number of standards, just as different countries have different standards of weights and measures.

Tone. Tone is the intensity of a color, and consequently depends upon its luminosity. The term tone covers the entire scale of color, from its lightest to its darkest condition. The normal color is the key color of the scale of tones.

In the following scale of tones of blue, both the light and lighter blue and the dark and darker blue, are *tones* of the normal blue.

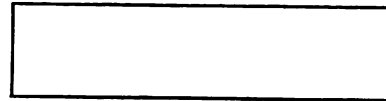
In a perfect scale of tones, the gradations from one intensity to the next would be so slight as to be almost imperceptible, and would end in white in one direction and in black in the other.



LIGHTER BLUE. (Tint 2.)



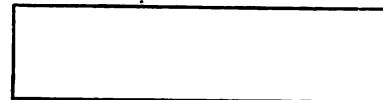
LIGHT BLUE. (Tint 1.)



BLUE.



DARK BLUE. (Shade 1.)



DARKER BLUE. (Shade 2.)

Tones of Blue.

In pigmentary colors, the various tones are produced by adding white or black to the basal color. Scientifically, the various tones

are produced by increased or diminished illumination. There may be tones of the hues, of the grays, and of other color effects, the same as of the normal colors, consequently there may be as many scales of tones as there are different color effects, for as every color and hue is susceptible of increased or diminished luminosity, each may have a scale of its own.

Tint. A *tint* is a tone of a color lighter or weaker than the standard tone.

The term is applied both to the normal colors and the hues when modified with white or with increased light.

In pigmentary colors a tint is produced by adding white to the standard color. In the prismatic colors it is produced by increased illumination.

Shade. A *shade* is a tone of a color that is darker than the standard tone.

In pigmentary colors a shade is produced by adding black to the standard color. In the prismatic colors it is produced by diminished illumination.

The tints and shades of a color are its different *tones*, the tints being lighter and the shades darker than the accepted standard of intensity.

Hue. *Hue* is a variety of color. The term is applied to the modifications which a color receives by the addition of a small quantity of another color; thus, if a small portion of blue is mingled with red, we have a blue red, which is a hue of red. The number of hues of a color are unlimited, but for convenience in teaching, generally not more than two hues of each color are used. The last name indicates the color family to which the color belongs, and its first name is the added color.

In *blue green* the prevailing color is *green*, with a little blue mixed with it; in *green blue* the prevailing color is *blue*, with a little green added to it.

Broken colors. *Broken Colors* are the normal colors, or the hues dulled more or less by the addition of both black and white (gray).

Chevreul defines *broken colors* as "Pure colors mixed with black from the highest to the deepest tone," and his translator adds: "The tones which stand above the pure color are broken tones." This is equivalent to calling the *shades* of a normal color *broken colors*, and the *tints* of a normal color *broken tones*.

Value. Value is the luminous intensity of a tone, hue or color, in relation to other tones, hues, or colors in the same composition.

Unit of value. In *black and white work*, the basis of comparison, or key to the values, is usually *black*, or the darkest part of the composition, and all of the variations of light and shade in the composition are given a relative intensity or tone value, compared with the key tone.

If these variations do not hold a right relation to one another, the composition is said to be weak, poor, or faulty in values.

In *color work* the basis of comparison is usually white. Many artists, when sketching, put a slip of white paper upon some object in the foreground, as a basis of comparison for determining the tones and hues of the various colors in the scene they are painting.

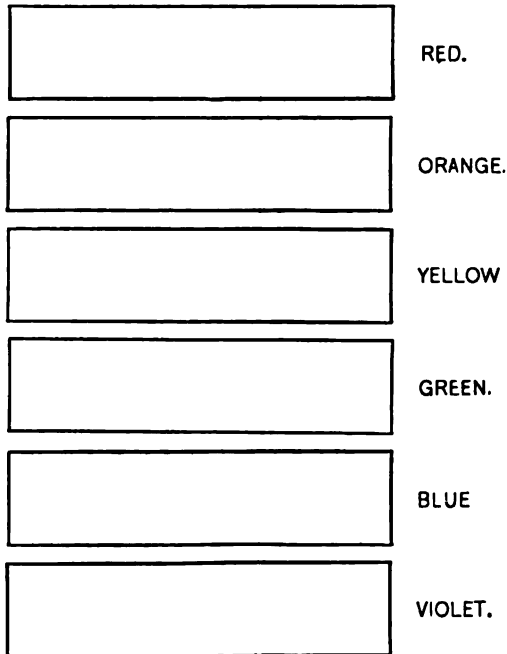
In elementary color work, keeping the values of the composition, means having a harmonious balance of tone or intensity of the different colors used, so that the combined effect is not injured by an excess of any particular color. For instance, a light blue and a pink will go nicely together, as far as values are concerned, because neither is sufficiently intense to overpower the other; but an equal quantity of light blue and normal red would not harmonize in value, because the greater intensity of the red would overpower the light blue. When the intensities of the colors differ, the quantities must also differ, if the values are to be preserved.

Potentiality. *Potentiality* is the power or strength of a tone, hue or color to affect other tones, hues or colors when combined or associated with them. The potentiality or combining influence of the spectrum colors is in this order: yellow, orange, red, green, blue, violet.

Quantity Value. From this it is evident that there is a quality value and a quantity value as well as an intensity value, and that it is very seldom that equal quantities of two or more colors can be used in a combination when we desire to produce a harmonious color effect.

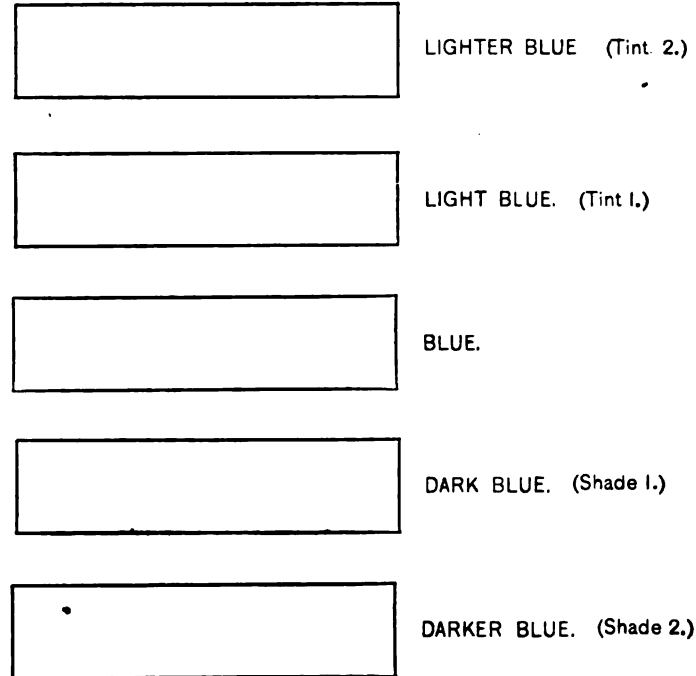
Scaling. *Scaling* is the arrangement of colors in the order of their *sequence, intensity, or variations*. In addition to the scaling of the normal colors, there may be as many different scales as there are different hues and different variations in light and shade. Scaling may be by *normal colors*, by *tones*, by *hues*, or by these combined.

A scale of normal colors consists of the regular arrangement of the normal colors in their prismatic order.



Scale of Normal Colors.

A *scale of tones* is a regularly graded arrangement of the tints and shades of a color.

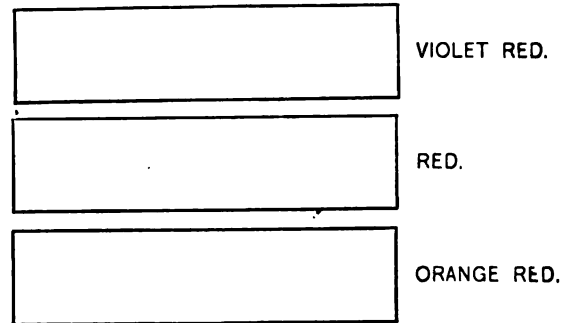


Scale of Tones of Blue.

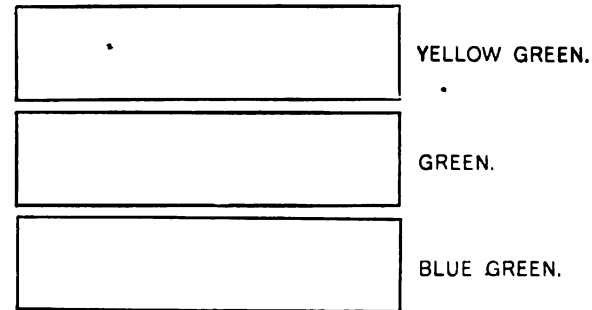
A scale of *tones* may consist of any number of different tones or intensities of the *same color*; but they must be arranged in the order of their sequence, from dark to light or from light to dark.

The term *tone* covers all the variations of a color that can be produced by adding either white or black to the basal color, whether it be a *normal color* or a *hue*; but only one of these (either white or black) may be added, else it becomes a broken color.

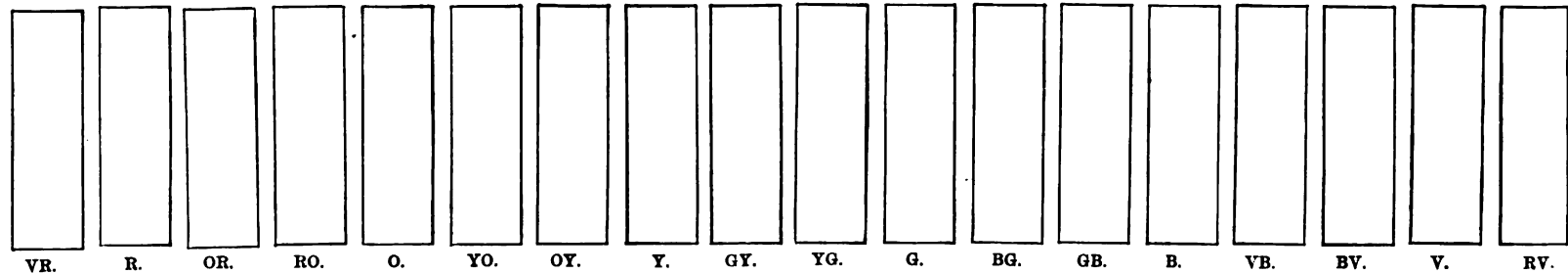
A scale of hues of a color consists of a normal color and its hues.



Scale of Hues of Red.



Scale of Hues of Green.



Full Scale of Hues.

A scale of *hues* and *tones* of a color consists of a normal color, its hue, and their tints and shades. [For illustration, see next page.]

When the color that is added to produce a hue is in excess of the basal color, then the added color becomes the basal color in name.

Pigmentary colors. Pigmentary colors are those colors that are largely composed of material substance. They are used chiefly in painting, and are divided into two general classes, *transparent colors*, and *opaque* or *body colors*. The transparent colors are used to a great extent in water-color painting and dyeing; the opaque colors in oil painting.

Transparent colors. Transparent colors are those colors that have so little substance that they do not fully obscure the texture or color of the surface to which they are applied.

Opaque colors. Opaque colors are those colors that entirely obscure the underlying color of the surface to which they are applied.

Warm colors. Red, Orange and deep Yellow, and the hues in which they predominate, are called warm colors. Orange is the warmest of these colors.

Cool colors. Green, Blue and pale Violet, and the hues in which they predominate, are called cool colors.

Complementary colors. A complementary color is one that will produce white (gray) when mixed with a given color. "As white is the sum of all the colors, if we take from white a given color, the remaining color is its complementary color."

It is well known and easily demonstrated that visual impressions are not instantaneous, but that an object looked at intently leaves its impression for a brief period after the eye has been removed from it. This is true not only of form, but also of color, only in the case of color it is not the color that was looked at that asserts itself, but its opposite or complementary color. If, for instance, the eye has been fixed upon a red object for a short time, and is then turned to a sheet

of white paper, the place looked at will not appear to be white, or of the color just seen, but of a blue green hue. This is the complementary of red; that is, if this color is mixed with red, it will produce white (gray). These are also known as *opposite* colors and *contrasting* colors. The cause of this effect of opposite or complementary colors is explained in this way: When the eye looks at a white object, all of the nerves are equally excited and equally active, and consequently become equally fatigued; but if a red object is looked at, then only those nerves that are acted upon by the waves that produce red are affected, and the others are in a state of rest; but just as soon as the eye is turned from the red object, the other nerves assert themselves, and the nerves, that were acted upon by the red, having become temporarily enfeebled, are overpowered for the time and a color is perceived, that, if added to the red, would produce white (gray). Whatever color is looked at, its complementary is afterwards impressed upon succeeding objects for a brief time.

Luminous colors.

The luminous colors are those colors that reflect light in large quantities; these are Yellow, Orange, Red and bright Green.

These colors are most luminous when used without the mixture with them of other colors.

Yellow is the most luminous of the colors.

Rood calls *luminosity* one of the three color constants, the two other being *purity* and *hue*. "It is evident, then," he says, "that brightness or luminosity is one of the properties by which we can define color; it is our second color-constant"

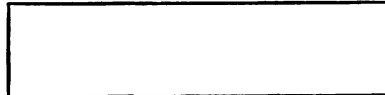
Harmony of colors.

Harmony of colors is such an agreement between the different colors of a design or composition as will produce unity of effect.

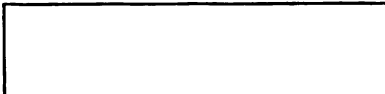
Scale of Yellow Green.



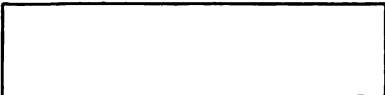
LIGHTER YELLOW GREEN. (Tint 2.)



LIGHT YELLOW GREEN. (Tint 1.)



YELLOW GREEN.



DARK YELLOW GREEN (Shade 1.)

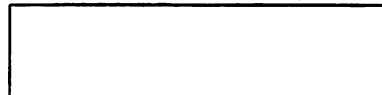


DARKER YELLOW GREEN. (Shade 2.)

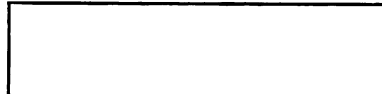
Scale of Green.



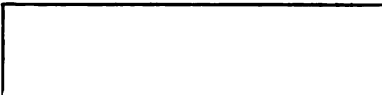
LIGHTER GREEN. (Tint 2.)



LIGHT GREEN. (Tint 1.)



GREEN.



DARK GREEN. (Shade 1.)



DARKER GREEN. (Shade 2.)

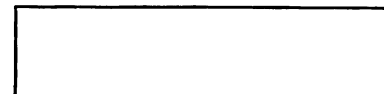
Scale of Blue Green.



LIGHTER BLUE GREEN. (Tint 2.)



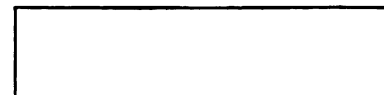
LIGHT BLUE GREEN. (Tint 1.)



BLUE GREEN.

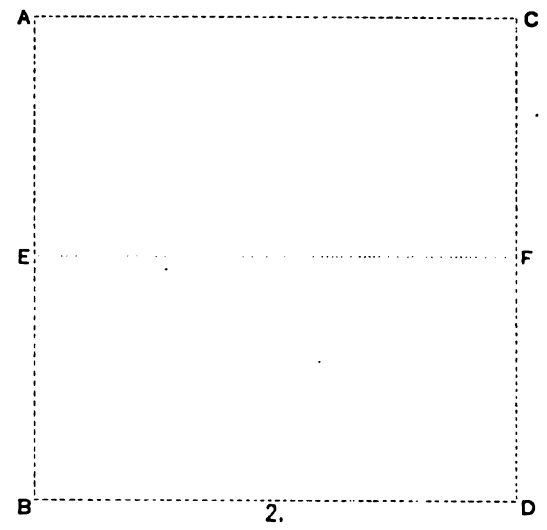
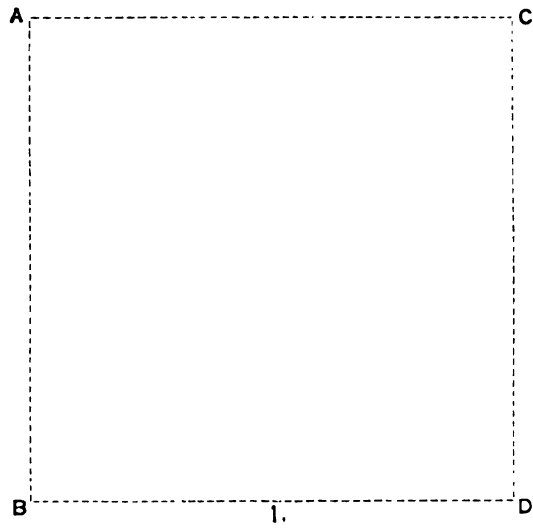


DARK BLUE GREEN (Shade 1.)



DARKER BLUE GREEN. (Shade 2.)

Scale of Hues and Tones of Green.



Normal Red.

This is one of the colors of the solar spectrum, and is therefore classed as a primary or pure color.

It is also classed as a warm color, because it has somewhat the hue of fire and other objects that are intensely hot.

There are a number of flowers, autumn leaves and fruits, when in season, that furnish beautiful illustrations of the various tones of red. Normal red is nearly the color of carmine (not aniline) ink, and differs but little from that of a ripe, red cherry.

Red, when placed by the side of green, increases its intensity; green also increases the intensity of red.

Mount the square in place by touching the back with four slight touches of liquid glue, mucilage or paste.

The complementary color of red is blue green.

To study the Square.

In studying the square, notice these features:

- that its sides are all alike in length;
- that its boundary lines are all straight;
- that its opposite sides are parallel;
- that its angles are all right angles;
- that the name of the figure is a square.

To draw the Square.

1. Place a dot to locate the upper right hand angle.
2. Place another dot directly under this, and just as far from it as the length of the side of the square.
3. Connect these two dots by a straight line.
4. Place a dot level with the first dot, and just as far from it as the second dot is from the first.
5. Connect these two dots by a straight line.
6. Place a dot level with the lower end of the vertical line and directly under the right end of the horizontal line.
7. Join these two dots by a straight line.
8. Connect the lower ends of the vertical lines.

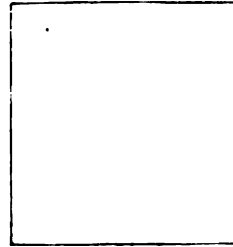
Normal Orange.

The color should be studied before the paper is folded. Next to red this is one of the most pleasing of colors, and is used extensively in the personal adornments of many primitive people.

In water color orange chrome gives the color.

There are many different objects that are of an orange color, such as flowers, fruit, birds, etc.

The complementary color of orange is green blue.



To fold the Square.

Bring the opposite sides of the square together, color side in, and crease it through the middle. Leave it folded and study the figure.

In these features it is like the square.

Its opposite sides are parallel.

Its angles are all alike, and are all right angles.

It is a plane figure.

In these respects it differs from the square.

It has only its opposite sides alike.

It is longer in one direction than in the other.

Open the square and study the fold.

It is a straight line.

It passes from the middle of one side to the middle of the opposite side.

It divides the square into two equal parts.

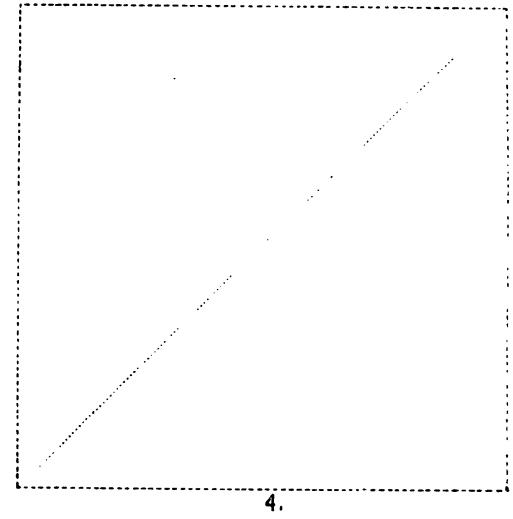
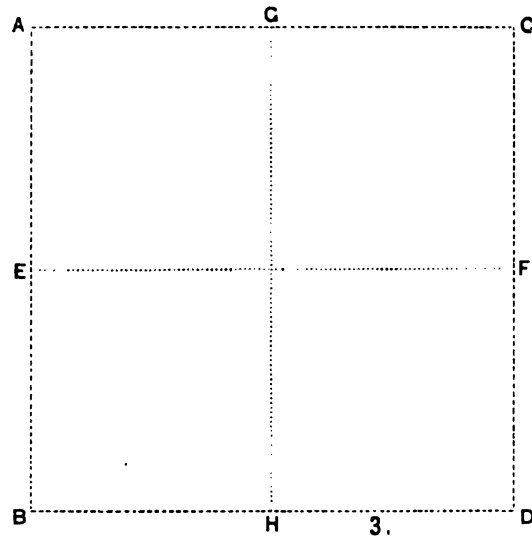
The figure is composed of five lines of equal length.

It has eight right angles.

This line passing through the middle of the square and parallel with two of its sides is, for convenience, called a diameter of the square.

To draw the Square.

1. Mount the square in place and draw it. Proceed as in the last exercise until the square is finished.
 2. Find a middle point on the two vertical sides.
 3. Connect these by a straight line.
- The square forms one of the six faces of the cube.



Normal Yellow.

We are more familiar with normal yellow than we are with most of the other colors, because it is met with in nearly its full intensity oftener than they are.

Nature furnishes several good illustrations of this color, and a large number of natural objects will suggest it, as will be seen by observing the color of butterflies, birds and flowers.

In nearly every style of decorative art yellow is used to some extent, sometimes as a pigmentary color, but oftener gold is used in its stead. In Moresque art, where yellow is used extensively, gold is almost always employed instead of the yellow pigment, and in Byzantine art, the ground for the interlacing patterns is generally gold.

Aurora yellow gives this color in water colors.

To fold the Square.

1. Bring the opposite sides together, color side in, and crease.
2. Open the square and bring the opposite sides together and crease again; then open and mount. Care must be taken not to use too much glue in mounting the squares. Four slight touches, put on with the end of a tooth pick, will answer every purpose better than a larger quantity. If paste is used the touches will have to be larger.

To draw the Exercise.

1. Draw the square as heretofore explained.
2. Bisect each side.
3. Draw the vertical diameter.
4. Draw the horizontal diameter.

Normal Green.

During part of the year green is the most prevalent color in nature, and it is much more pleasing in nature than it is in art or dress. Many of the so-called greens in nature, however, incline more towards yellow than green, and experiments in out-of-door sketching soon convinces the painter that things are not so green as they seem.

Green in its full intensity is a difficult color to handle, as it is so likely to look crude unless it is rightly combined with other colors.

Much help may be gained toward the right use of this color by noticing where it is used in art and dress, and what colors are generally used with it.

In stained glass windows intense green is sometimes used very effectively.

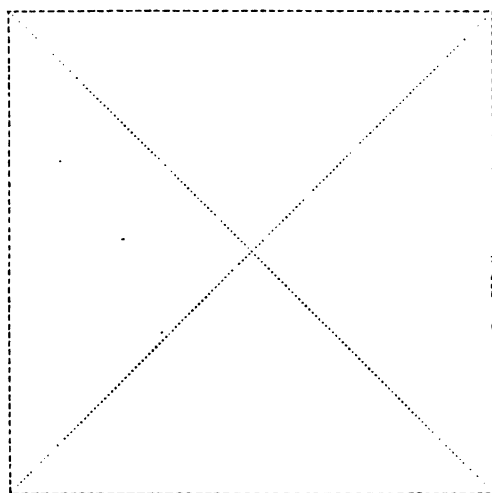
For general use the subdued greens, those approaching the grays and yellows, are more satisfactory than the brighter ones.

The Egyptians used green profusely in their decorations, while Greeks used it only sparingly.

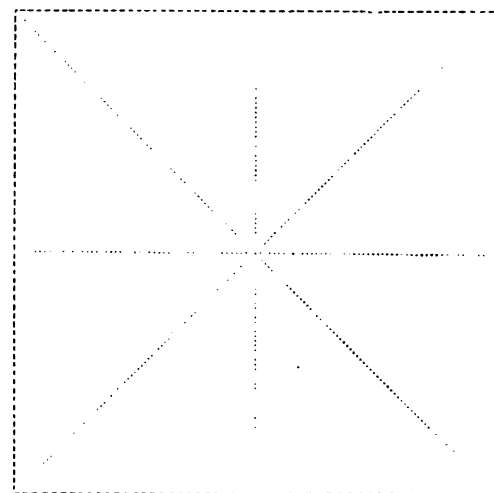
Concerning the effect of green upon the complexion, CHEVREUL says that a "delicate green is favorable to all fair complexions which are deficient in rose, and which may have more imparted to them without disadvantage. But it is not favorable to complexions that are more red than rosy; nor to those that have a tinge of orange mixed with brown, because the red they add to the tint will be of a brick-red hue. In the latter case a dark green will be less objectionable than a delicate green."

To fold and draw the Square.

1. Bring its opposite corners together and crease.
2. Study the angles and triangles made by the folding.
3. Mount it in place.
4. Draw the square.
5. Draw its diagonal. This line may be drawn with either an upward or a downward stroke.



5.



6.

Normal Blue.

Blue is classed as a restful, also as a receding, and a cool color. It is unobtrusive wherever used, especially in its lighter tones. We never think of associating this color with boldness or obtrusiveness. It is the color with which nature paints many of our spring flowers, as the bluebells, blue violets, bluets, larkspur, skull-cap, harebell, and many others that may be readily recalled. Nature, however, seldom uses color in its purity, and none of these flowers are good illustrations of normal blue,

most of them having a violet hue. Light blue is so nearly allied to white that it is often added to white to increase its whiteness. Painters and decorators, and even laundresses make use of blue in this way.

While light blue so much resembles white, dark blue has just the reverse effect, and approaches black more nearly than any other color, and in picture painting and decorating it is often used instead of black.

Used in dress, the lighter tones of blue are suitable to most blondes, as it adds just a suggestion of warmth to the complexion; for the same reason it is not suited to brunettes, since their complexions already possess enough orange color. The cause of this, and general effects of this sort, will be better understood by referring to the observations made by Sir David Brewster, on the subject of accidental colors. He says, 'If we place a red wafer on a sheet of white paper and fix the eye upon the red spot, and then turn the eye to white paper, we shall see on it an image of that spot of a bluish green color. The reason of the bluish green image of the red being seen, Brewster shows to be that "the part of the retina occupied by the red image is strongly excited or deadened by its continued action, the sensibility to red light will therefore be diminished, and the deadened part will be insensible to the red rays which form part of the white light from the paper, and the paper will appear of that color which arises from all the rays in the white light, but the red, that is bluish green."

The complementary color is always projected for a brief time upon the object at which we look after the eye has been fatigued with some other color; consequently, in the case of blue in dress, after looking at the blue color, its complementary color, orange, will be mingled with the color of the object looked at immediately afterward.

To draw the Exercise.

After the color has been studied, the square should be folded for its diagonals, mounted in place and drawn.

Normal Violet.

This color varies but little from purple, being but slightly bluer in hue. In pigmentary colors it is produced by mixing red and blue. Scientifically it is the last of the six prismatic or normal colors.

There are many familiar flowers that will recall this color and help to impress it, although it will be difficult to find any objects in nature that show it in its intensity. Of the flowers that may be mentioned are the violets, asters, mor-

ning-glories, irises, heliotropes and lilacs; all of these, however, are modifications, either in tone or hue of the pure violet color.

Violet is a color that is more easily managed in a combination than some of the other colors, and is often used in dress when subdued in tone or hue.

The following combinations are considered allowable:

Violet and green yellow, or yellow green.

Violet and orange, orange yellow, or yellow.

Violet and orange and green.

Violet and gold, or gray.

Violet also harmonizes with several other colors when more than two enter into the combination. Violet does not combine well with red or purple; blue and violet also go badly together, without the presence of another color.

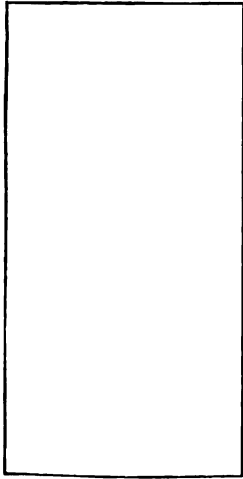
Concerning the positive colors, Rood says: "When the colors are arranged according to the order in which they exhaust the nervous power of the eye, it is found that green leads the list; violet, blue violet, and blue follow; then comes red and orange, and last of all yellow. This is also about the order in which we are able to enjoy (or tolerate) positive color in painting."

The complementary color of violet is green yellow.

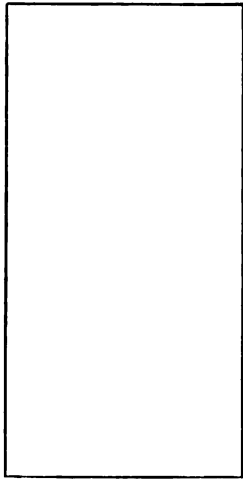
To fold and draw the Square.

After the color has been studied the square should be folded to form its diagonals and diameters; these should next be carefully studied as to position, and the relation they hold to one another; then the square should be mounted in place and drawn.

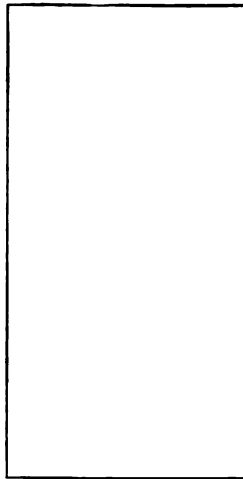
SCALE OF THE NORMAL COLORS.—To FOLLOW THE STUDY OF THE NORMAL COLORS.



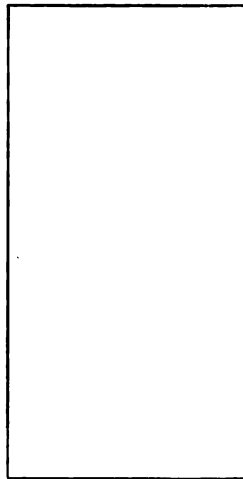
RED.



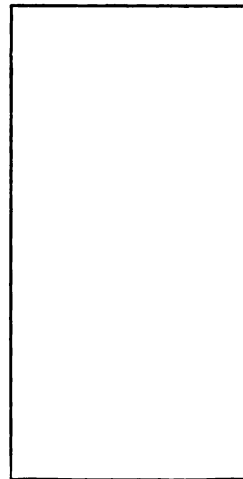
ORANGE.



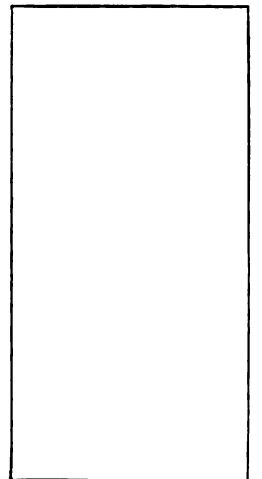
YELLOW.



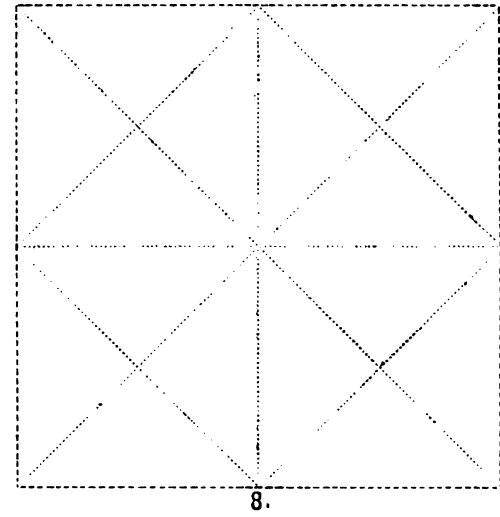
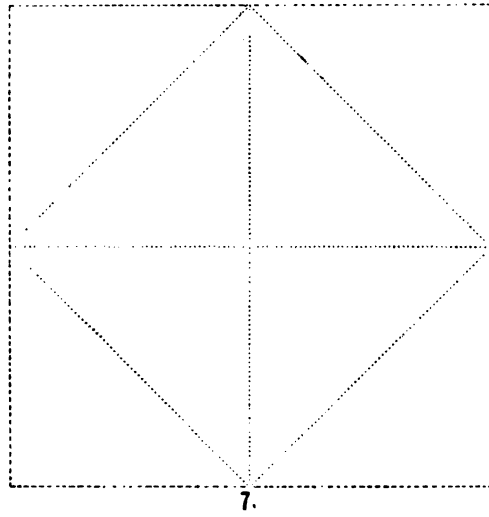
GREEN.



BLUE.

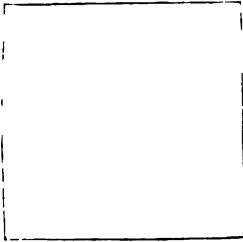


VIOLET.



Light Red.

Light red is any tone of red that is lighter than the normal color.



Like the normal red, the deeper tones of the tints are not suitable for coloring large surfaces, as such brilliant colors impress themselves so permanently upon the mind, that when once seen in large quantities, the previous impression is immediately recalled upon again seeing the object so colored.

The main aim in both dress and decoration should be to produce such a combination that the effect will be pleasing but not obtrusive.

Two of the light red tablets mounted, one upon a black card and one upon a white card, will illustrate the effect that a background has upon a color.

The complementary, or contrasting color of red, is blue green, and a tint of blue green will harmonize with light red.

The tone of the colors, used to illustrate the tint of the colors, should be that next to the normal color in intensity.

To fold the Square.

1. Fold for the diameters; do this by bringing the opposite sides of the tablet together and pressing the folded edge so as to make a crease.

2. Open the square and crease in the opposite direction and then open it again.

3. Study the different angles, triangles and positions of lines in the tablet.

To draw the Exercise.

1. Draw the outline of the square, left side, top line, right side, bottom line.

2. Draw its diameters.

3. Finish by connecting the adjacent ends of the diameters by straight lines.

Light Orange.

Light orange is one of the common colors in nature. The sky is often streaked with in the morning and tinted with it in the evening. It is found in many of the pleasing combinations of color that beautify our fields and gardens, and the name at once recalls several common wild flowers and vegetables, as the marigold, nasturtium, and jewel weed, and the pumpkin, squash, and also a few insects.

This is a color that is too bright to be used in decoration, except in small quantities, and in association with other colors. Its various tones are, however, favorite colors with gypsies, negroes, indians, and people of primitive tastes generally.

To fold the Square.

1. Fold for the diagonals, opening the square after each fold.
2. Fold for the diameters, opening the square each time as before.
3. Fold the outer corners in to the center point.

To draw the Exercise.

1. Draw the square.
2. Draw its diagonals, the one from the upper left, to the lower right corners first.
3. Draw the diameters.
4. Connect the adjacent ends of the diameters by straight lines.

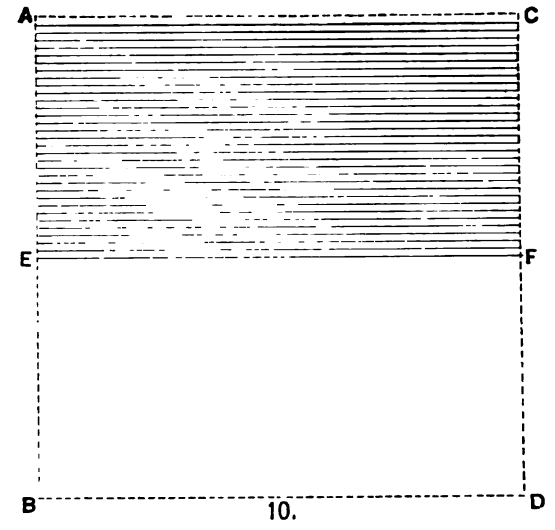
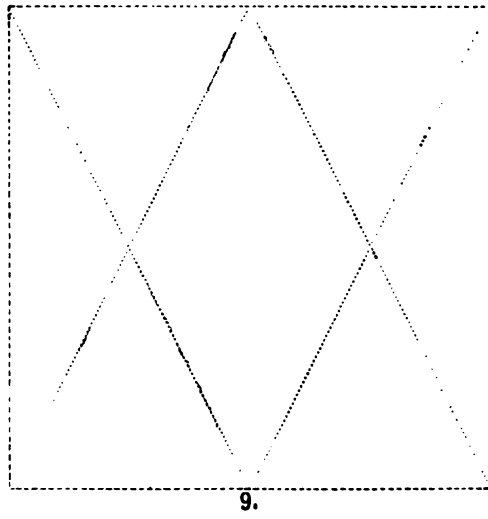
Definitions and Explanations.

TONE is the intensity of a color or hue. It may be of any intensity between white and black.

A **TINT** is a tone of a color that is lighter than its normal or standard tone. A **SHADE** of a color is a tone that is darker than its normal or standard tone.

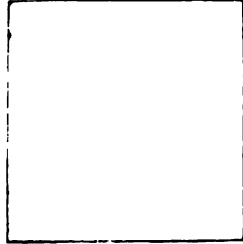
The tints and shades of the prismatic colors are produced by increased or diminished illumination.

The tints and shades of the pigmentary colors are produced by the addition of white or black to the standard colors.



Light Yellow.

Light yellow is any tint of yellow that is lighter than the normal yellow. This, like the other colors, will be most successfully learned by having the normal color and one tint, and one shade of yellow near it, for the purpose of comparison and contrast. These colors should be arranged in order from the lightest to the darkest. This is called scaling.



A note should be made, and if possible a specimen secured of any object that illustrates the color that is being studied.

The benefit of this exercise is not so much in the collected material as in the training of observation required in making the collection.

The sky, at sunrise and at sunset, often presents beautiful tints and shades of color.

To fold the Square.

To fold the square for the creases, bring the opposite sides of the paper together and press the top and bottom of the middle fold just enough to mark the middle points on the opposite sides; then fold from the opposite angles of the square to these middle points. Open the paper after each fold.

To draw the Exercise.

First outline a square of the required size; after this is drawn, mark the middle of the upper and lower sides. Draw from the upper middle to the lower left side angle, and then from the upper right side angle to the lower middle point. When this is done, change the position of the hand, and draw from the upper left side angle to the lower middle point, and from the upper middle to the lower right side angle.

Light Green.

Nature furnishes a great variety of greens. Most of them, however, are lighter than normal green, and incline towards yellow in hue.

This is shown by taking a variety of leaves and studying their tones and hues in association with the normal green.

The most valuable office of green is to give brilliancy to a design. It combines well with gold, and yellows of gold color, but is seldom agreeable when used in combination with several different colors.

A light green pattern upon a dark green ground will be found pleasing in effect. The reverse arrangement is not so satisfactory.

Green is a color that is difficult to handle in large masses, and it needs other colors to assist in producing a harmonious effect.

A light green, or a grayish green, however, usually looks better when used upon walls or in other large masses, if used alone or with simply a stripe or border of a darker tone of the same color.

Light green, like blue, is a restful color, and a subdued green fatigues the eye the least of any of the colors.

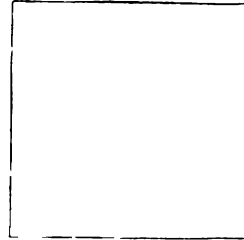
The pencil tinting shown in the exercises upon this page is not to be copied, but it is given upon this and the two following patterns to indicate the shape and position of the square when folded. The folded square should be mounted upon the tinted surface and be copied in outline.

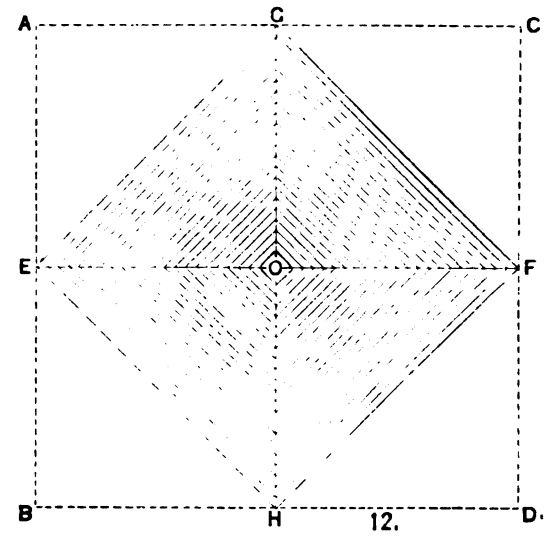
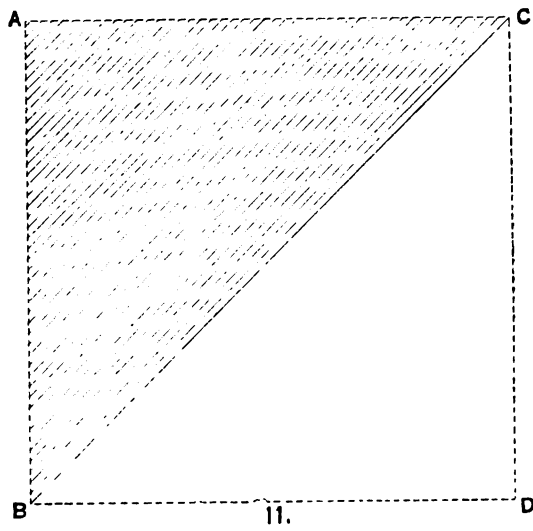
To fold the Square.

Bring the opposite sides of the paper together, and keep them in place with a touch of glue at each end. Then mount the rectangle upon the tinted surface.

To draw the Exercise.

Outline the square lightly, then draw its horizontal diameter and strengthen the lines of the upper half of the square.





Light Blue.

Light blue is a restful and retiring color. It has the effect of making objects appear more distant than they are. This is why it enters largely into the decoration of ceilings and small rooms. It is one of the cool colors, which puts it in demand for summer draperies. White is also a cool color and forms an agreeable harmony with blue, without the assistance of other colors. The tints of blue are more

satisfactory for elementary designing that the shades of blue, and those that incline towards light gray in tone are more pleasing than those that are intense and cold in color.

To fold the Square.

Bring the opposite corners of the square together, and keep them in place with a touch of glue; then mount the triangle upon the tinted surface as in the last exercise.

To draw the Exercise.

Outline the square, then draw its diagonal from the upper right to the lower left hand corner, and strengthen the top and left side lines of the square.

Light Violet.

Violet is a variety of purple; unfortunately the color of purple is somewhat indefinite. It is said to be red graduated with blue. While in violet the red and blue are equally blended. Violet is therefore bluer than purple. Violet is one of the prismatic colors, and is best illustrated by the aid of a prism. It may also be shown by mixing a water solution of aniline purple and adding to it a little aniline blue.

Light violet is a tint of violet, and may be shown by sufficiently diluting a water solution of violet.

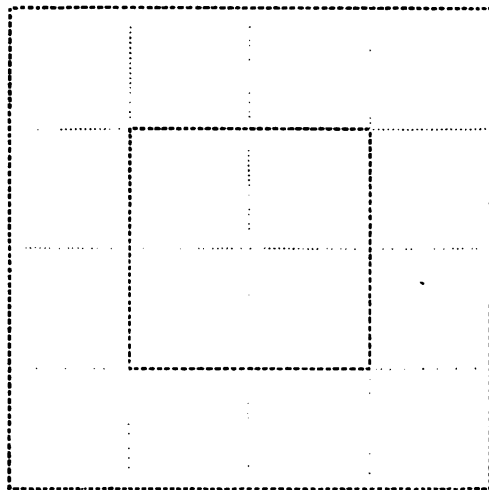
There are several flowers that approximate this color, of which the violet, some of the deeper colored lilacs, heliotrope, hyacinth, some asters, the iris, morning-glory, sweet pea, and several less common flowers are illustrations.

To fold the Square.

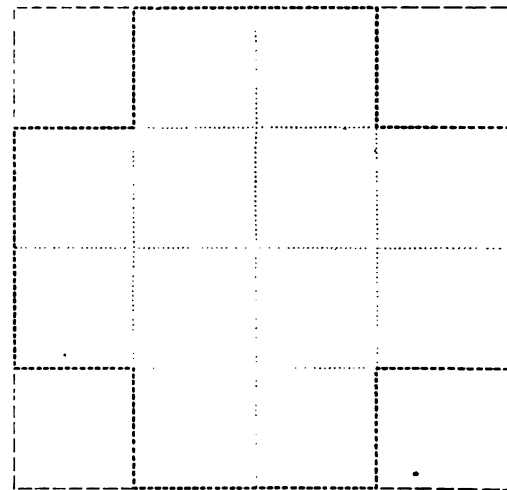
First fold the square for its diameters, then open it and fold each corner to the center point; fasten them there with slight touches of glue, and mount the pattern upon the tinted surface with its folded side up.

To draw the Exercise.

Draw the square. Connect the adjacent ends of the diameters with straight lines.



13.



14.

Dark Red.

This is the beginning of the study of the shades of the different colors. The variations of a color that are produced by adding black or white to the pure color are its different tones, and the different tones that are produced by diminished illumination, or by the addition of black to the pure color, are the shades of that color. There is no limit where a darkened color ceases to be a shade of that color until the

effect of the color is entirely lost and black is reached.

When studying this color, it will be found desirable to review normal red and its tints, so that the study of the shades of red may be begun with a clear understanding of the intensity of the normal standard from which the various tints and shades are judged.

Dark red is a tone of red that is darker than the normal color.

The tone of the colors, used to illustrate the shades of the colors should be that next to the normal color in intensity

To fold and cut the Hollow Square.

To fold and cut this pattern, bring the opposite sides of the paper together, color face in, then the opposite ends together; again bring the opposite sides together and the opposite ends together; now open the last two folds, and with the scissors cut out the small square formed in the middle of the paper—one cut each way, done carefully, gives the required pattern. Open the paper, and with touches of glue or paste at the corners stick it in place. Care must be taken not to use too much glue or the work is likely to be disfigured.

To draw the Hollow Square.

First outline the square lightly; find the middle of each side and draw light lines bisecting the square both ways. Bisect each half, dividing each side into four equal spaces. Connect the opposite points with guide lines drawn lightly; this gives lines corresponding to those in the folded pattern. Strengthen the lines forming the outline of the figure.

Dark Orange.

An orange color that inclines towards red is called a deep orange, or red orange, and when it is simply darkened, either by the absence of light or by the addition of black, it is a shade of orange.

It is a color often met with in flowers, fruit and autumn foliage. In its darker shades it forms a pleasing combination with the hues of subdued yellow, especially when a stripe or small figures of black forms part of the design,

and it is often used in this way in tile work. Two shades of dark orange are often combined as ground color and pattern in wall papers.

The use of two or more tones of the same color almost always form a safe and pleasing combination, especially if they are separated by a suitable stripe of some darker color; for this purpose a narrow stripe of black is usually satisfactory, as it clears up the effect of the various tones in the design. If, however, a dark edging is too wide, it makes the design look heavy and cumbersome.

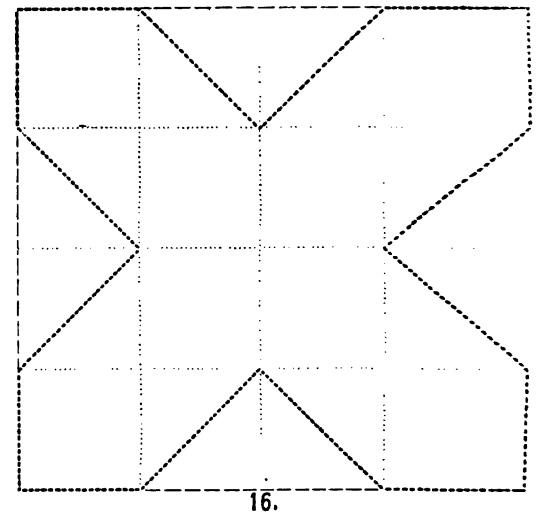
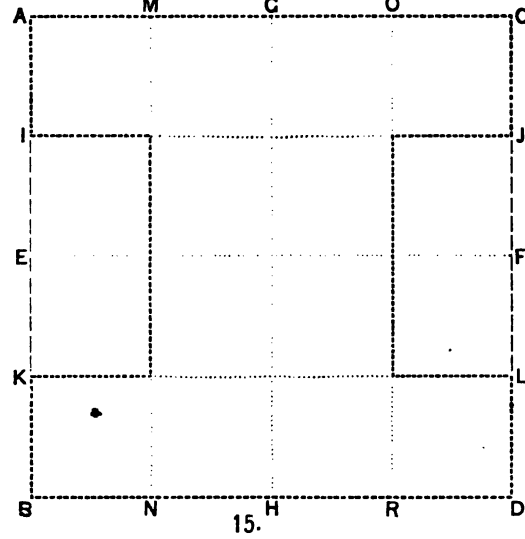
An Incised Square.

To cut this pattern, bring the opposite sides and the opposite ends together as in the last exercise, then fold again each way to produce the guide crease. Open it once each way so as to leave it only four folds in thickness. Cut out the small square that has raw edges on two sides.

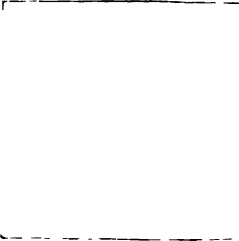
To draw the Incised Square.

Proceed as in the last exercise until all the guide lines are drawn, then strengthen the inner side of each corner square. Finish the sides of the figure in the following order: left side first, top line next, then the right side, and lastly the lower line.

A standard color is one which has a fixed value. It is the basis from which we determine tints, shades and hues.



Dark Yellow.



This color should be studied in association with the normal yellow. Compared with the other yellows it will be found less luminous than the normal yellow, and not so red in hue as normal orange.

To cut the Inverted H.

To fold this square for cutting, bring the opposite sides together, then fold the opposite ends together, repeat this in both directions and press the edges to form the crease.

Open the paper once each way and cut out the small square that has only one raw edge : this gives the H form.

With slight touches of glue or paste fasten it in place in an inverted position as shown in the illustration.

To draw the Inverted H.

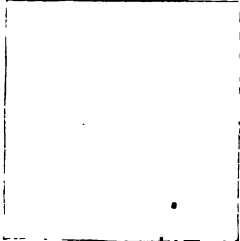
First draw the large square in the usual way, left side first, then the top line, next the right side; and lastly the lower line.

When the square is finished, bisect each side, then each half of the sides ; this will divide each square into four equal parts.

Draw, as lightly as possible, guide lines connecting the opposite points on the side lines, then the opposite points on the top and bottom lines ; this will divide the large square into twelve small squares.

Finish the exercises by strengthening the lines that form the outline of the pattern.

Dark Green.



As heretofore suggested, this color may be studied by comparing it with the normal green, by comparing and contrasting it with other greens, and by noticing dark green objects in nature and art.

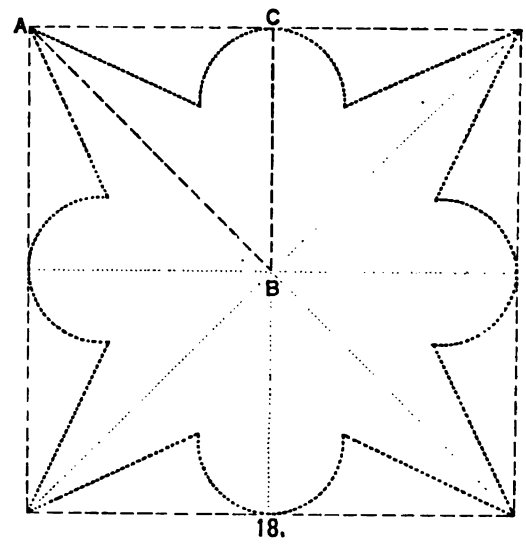
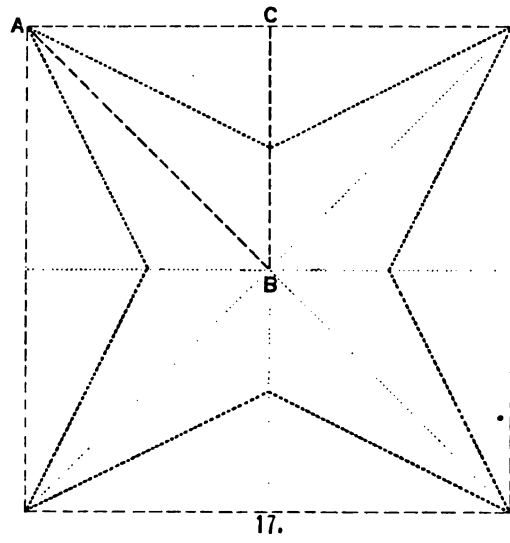
To cut the Inverted Greek Cross

To cut this figure, fold the sides of the square together and the opposite ends together, as in the last exercise. Fold the opposite sides of this small square together again and open this last fold, then its opposite ends together and open as before ; this will leave a small square of four thicknesses. Next bring together the opposite corners of this small square that have only one raw edge ; this forms a right angled triangle. Cut the diagonal of the small square at the right angle.

To draw the Greek Cross.

Draw the guide lines as in the last exercise. Finish by drawing the right angles at the outer corners first, then the lower line that slants from the upper part of the left side towards the right side of the lower line. Next the lines parallel with this. Finish by drawing the slanting lines that are nearer to the upper left hand corner, and lastly, those that are parallel with it.

Small figures of this shape may be combined to form several different designs.



Dark Blue.

Review normal blue, and fix its color clearly before attempting to study its tints and shades. By taking small squares of tints, shades and hues of blue, and selecting from them the normal color, the exercise will be more interesting and instructive.

The color of normal blue is that of dry ultramarine, a pigment found in nearly all paint shops, and used extensively in painting. Any blue that is less luminous than the normal color is a shade of blue. Dark blue is, therefore, a shade of blue.

To fold and cut the Pattern.

1. Bring the opposite sides of the square together.
2. Bring its opposite ends together.
3. Without opening it, fold for its diagonal, which should extend from the raw to the solid corner.
4. Draw a straight line from the middle of the folded side to the raw corner.
5. Cut along this line.

The patterns that follow this are all folded in the same way.

To draw the Pattern.

1. Draw the square.
2. Draw its diagonals.
3. Bisect each side and draw its diameters.
4. Divide the diameters into four equal parts, by placing points half way between the middle of the square and each side.
5. Connect these points with the corners of the square by straight lines, beginning at the upper left corner of the square.

Dark Violet.

Review violet and study dark violet as suggested for dark blue, before folding or drawing the square. Study it by comparison or association with objects that are like it in color, and by observing the colors of clouds, flowers, insects and wall decorations, for indications of this color. A collection of objects can be easily made that will be extremely helpful in this work.

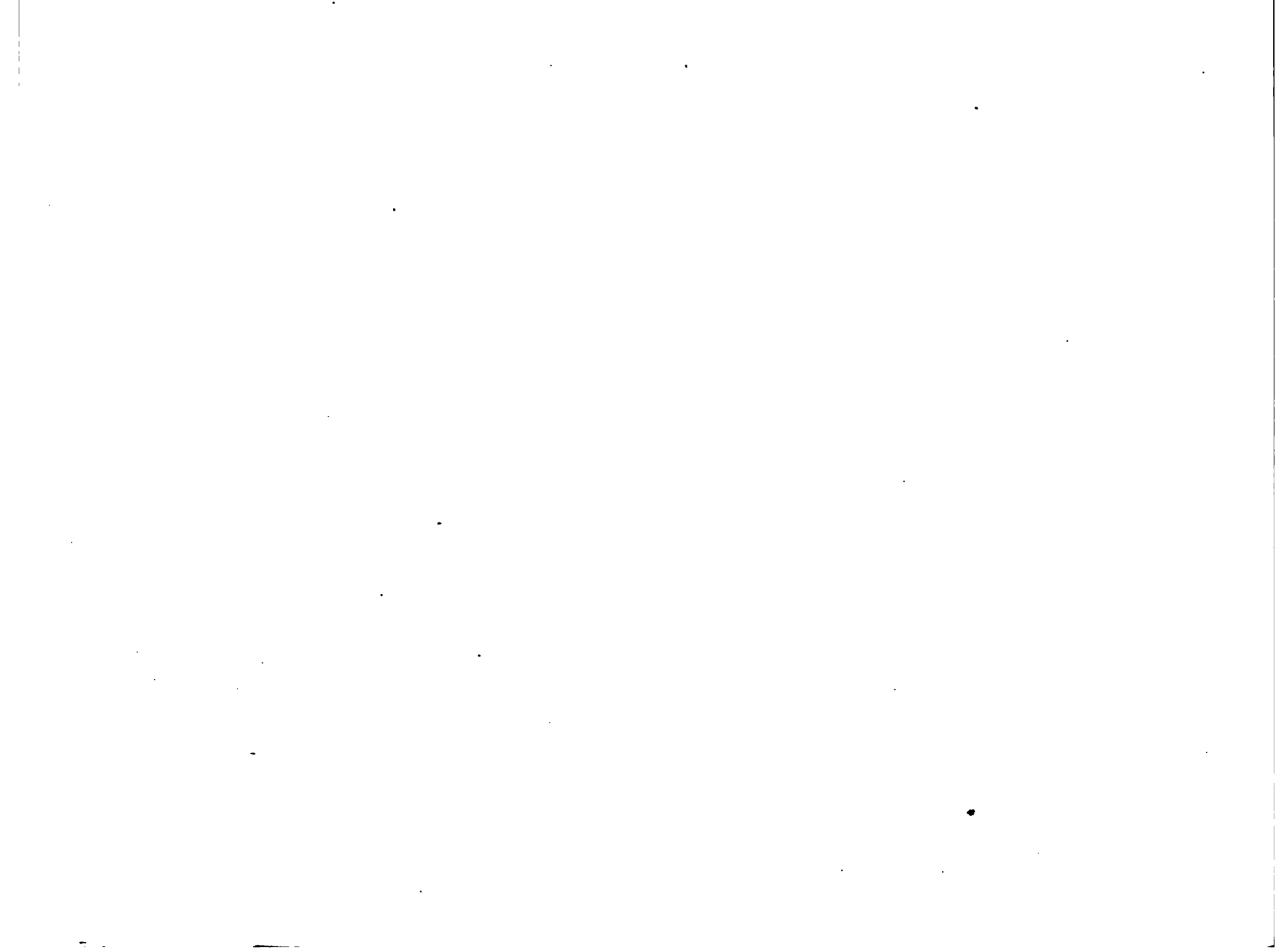
To fold and cut the Pattern.

1. Fold as in the preceding exercise, and then without unfolding it, mark out the outline as shown between A. and B.

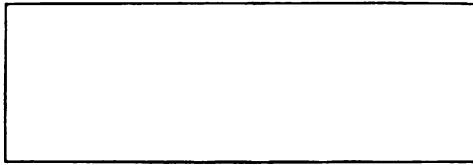
The patterns are given in the back of the book to mark these different exercises out by, so that they may just fit the printed outlines. They are arranged so that they may be cut from the page as they are needed.

To draw the Pattern.

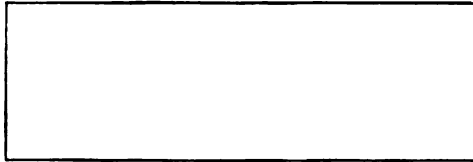
1. Draw the square.
2. Draw its diagonals.
3. Bisect each side and draw its diameters.
4. Draw the semi-circles that are tangent to the middle of each side. Begin the drawing with the curve at the top, next the one on the left side, then the one on the right side, and lastly the one at the bottom.
5. Draw the angles from the corners of the square in this order; the one at the upper left corner first; then the one at the upper right corner, next the one at the lower left corner, and finish by drawing the one at the lower right corner.



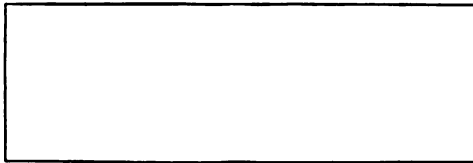
SCALE OF THE NORMAL COLORS AND TWO TONES OF EACH.—To follow the study of the tints and shades.



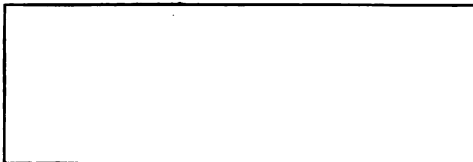
LIGHT RED, (Tint I.)



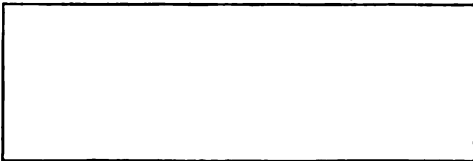
NORMAL RED.



DARK RED, (Shade I.)
Tones of Red.



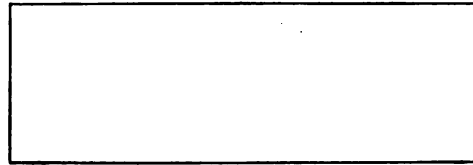
LIGHT GREEN, (Tint I.)



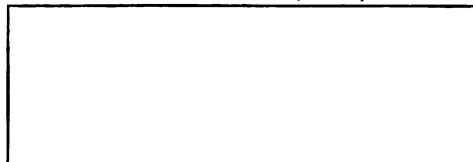
NORMAL GREEN.



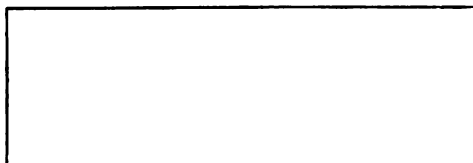
DARK GREEN, (Shade I.)
Tones of Green.



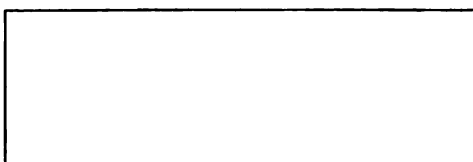
LIGHT ORANGE, (Tint I.)



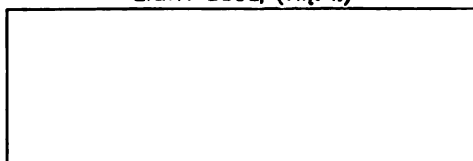
NORMAL ORANGE.



DARK ORANGE, (Shade I.)
Tones of Orange.



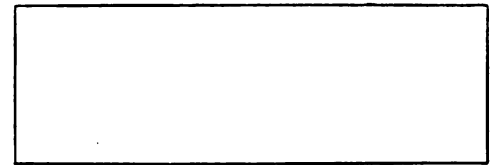
LIGHT BLUE, (Tint I.)



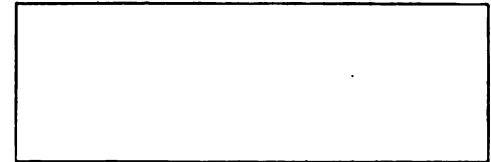
NORMAL BLUE.



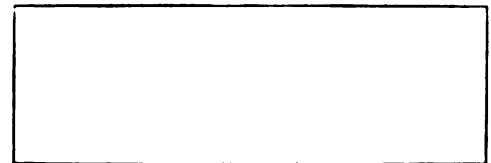
DARK BLUE, (Shade I.)
Tones of Blue.



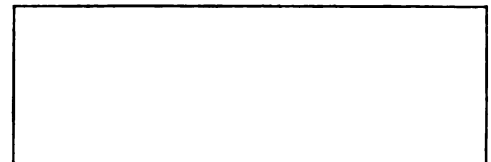
LIGHT YELLOW, (Tint I.)



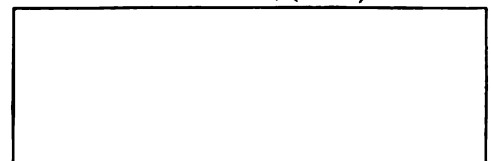
NORMAL YELLOW.



DARK YELLOW, (Shade I.)
Tones of Yellow.



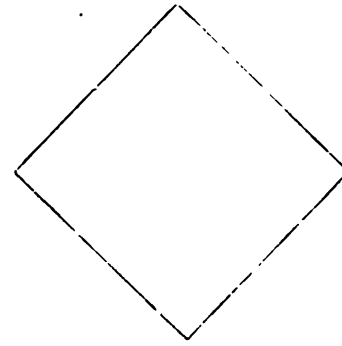
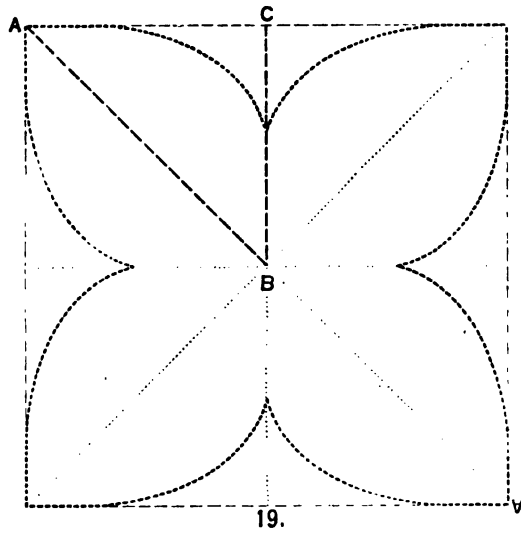
LIGHT VIOLET, (Tint I.)



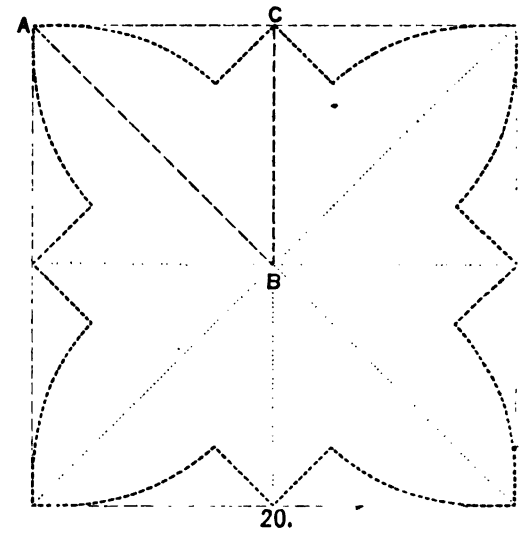
NORMAL VIOLET.



DARK VIOLET, (Shade I.)
Tones of Violet.



NORMAL RED.



Violet Red.

Violet red is called a strong color in effect, because it overpowers most colors that are used with it.

It is seldom used to advantage alone or in large quantities in any combinations; although in velvets it is sometimes used very effectively.

The beginner in color study is, however, advised to use it sparingly.

When studying color, even in its most elementary form, we should have two general aims in mind: first, the careful observation of color for its own sake,—to develop a love for the beauty of colors in nature and art,—and next, the application of color knowledge to dress and decoration. This last feature cannot be learned by rule, only to a very limited degree, and must depend almost entirely upon the possession of a fund of facts that can be secured only by study and observation.

Observation of color is the first step in color education, and this should be, to a great extent, the observation of colors in nature.

One of the laws of color that will be observed, is that nature does not use the intense colors in large quantities, but enlivens her grays, greens and browns, with but little touches of blue, red, orange and other bright colors.

To fold and cut the Patterns.

1. Bring the opposite sides of the square together.
2. Bring its opposite ends together.
3. Without opening, fold for a diagonal from the raw, to the solid corner.
4. Mark out and cut the pattern.

To draw the Pattern.

Draw the square first, then its diagonals. Bisect each side. Next place a dot opposite each of these bisecting points, and a little less than half way towards the center of the square. Draw the upper left and lower right lobes first, then the upper right and lower left lobes.

Orange Red.

To clearly and firmly impress the distinction between this color and normal red, the two colors should be studied together, then a number of mixed slips of the two colors should be taken and sorted. Place a square or circle of orange red upon a green or blue green background, and see the effect that the background has upon the color. The effect of the background will be to heighten or intensify the orange

red. This juxtaposition of colors is one of the underlying principles of color study. Two colors brought together almost always affect each other, sometimes to the advantage of both, sometimes of only one, and not infrequently to the injury of both.

Any color placed upon white usually has the effect of making it appear brighter and deeper in tone than when alone. Any color placed upon black usually appears lighter by contrast; the black, however, borrows slightly from the imposed color, and is often perceptibly affected by it. A few experiments with colored tablets, mounted or pinned upon sheets of black and of white paper, will clearly illustrate the effects of these backgrounds upon colors.

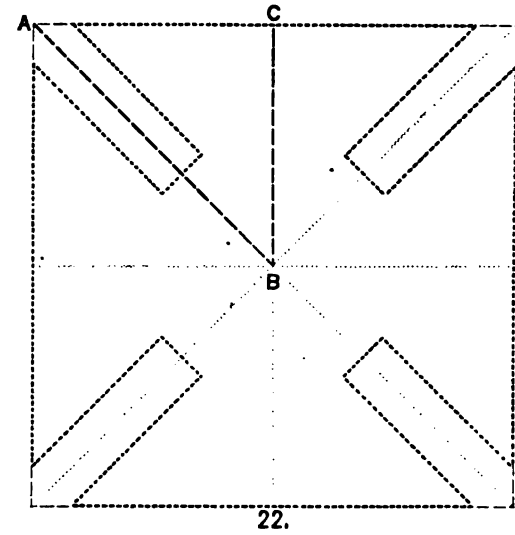
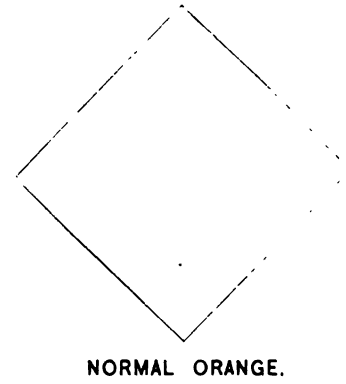
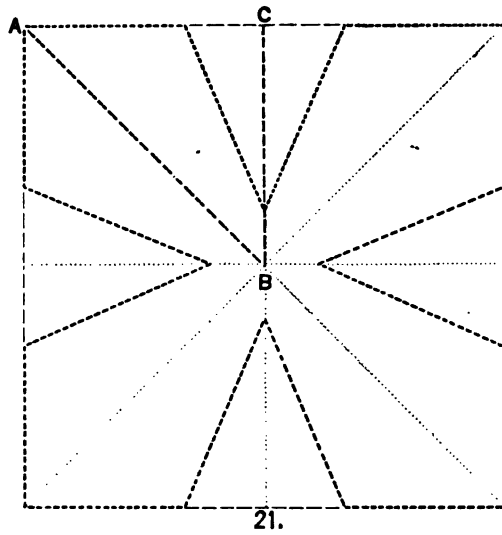
To fold and cut the Pattern.

The folding for this exercise, is just the same as for the preceding exercise. The patterns by which to mark out these exercises are printed in the back of this book.

To draw the Pattern.

To draw the figure, begin as in the last exercise, by drawing the square and its diagonals and bisecting the sides, then draw the diameters. These guide lines should be drawn as lightly as possible. When the guide lines are placed, draw an inner square by joining the adjacent bisecting points by straight lines, the upper left side first, then the lower right side, next the lower left side, and after this the lower right side. Divide each side into four equal parts by bisecting, then draw the curves from the corners of the outer square to the quarter points on the adjoining side of the middle square.

Complete the figure by strengthening any lines that may need it.



Red Orange.

Red Orange is nearly the color of scarlet. There are several flowers that suggest this color. What has been said about the red violet applies also to the red orange. Normal red and normal orange should be reviewed before taking up the red orange. After the color has been carefully studied the pattern should be drawn.

Among the many pleasing combinations of color met with in Greek designs, the following are a few of those in which red orange is used.

Red orange, blue and gold.

Red orange pattern upon a light orange yellow ground, enlivened with a light blue sparingly used.

A red orange ground with a light orange yellow pattern was used in many Pompeian color combinations.

The Byzantines used a red orange ground with black designs, which they usually separated with a slight band of white.

The Turks used red orange and black designs upon a light orange yellow ground. Red orange, blue and gold are the colors used largely in Moresque ornament, occasionally relieved with white or black.

To fold and cut the Pattern.

1. Fold the opposite corners of the square together.
2. Fold again the same way.
3. Fold the same way a third time. This will give a right-angled triangle of eight thicknesses of paper.
4. Divide the edges that form the right angle, each into three equal parts.
5. Draw a line from the point nearest the solid corner to the one nearest to the right angle.
6. Cut along the drawn line.

To draw the Pattern.

1. Draw the diagonals and diameters of the square.
2. Divide each side of the square into three equal parts.
3. Fix points on the diameters a slight distance from the center of the square.
4. Draw the V shaped figures.
5. Strengthen the lines that need it.

Yellow Orange.

"Yellow Orange or gold color as an element of surface decoration occupies a negative place, as a cold yellow pigmentary color is seldom used as a surface covering, except when it is a substitute for gold. Gold and its imitations form a common material for surface covering, and they have a striking effect when used for nail heads, mouldings, picture frames, and linear surface ornaments."

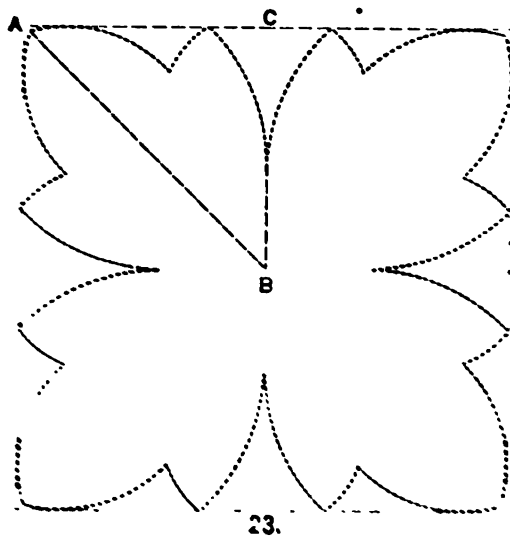
"In Moresque art, red, blue and yellow are the principal colors, but the yellow is usually gold. In Egyptian ornamental painting yellow takes its place the same as the other colors, and not as a substitute for gold. In the art of ancient Assyria, yellow occurs principally as the color of seams, trimmings, fringes and tassels. As symbolic colors gold and yellow were in Christian symbolism emblems of faith. The sun, gold and yellow, were the symbols of divine love, enlightening the human understanding, and it is in this sense that Solomon says that the head of the wise is of the purest gold. The ancients compared to gold that which they judged faultless and exceedingly beautiful. In China also, yellow is the symbol of faith." Colors are not now used symbolically in Christian art.

Study this color by comparing and contrasting it with the colors of fruit, flowers, and other objects. The orange, pumpkin, marigold, autumn leaves, nasturtiums and similarly colored objects, will be useful helps in fixing permanently the exact color of yellow orange.

To fold the Pattern.

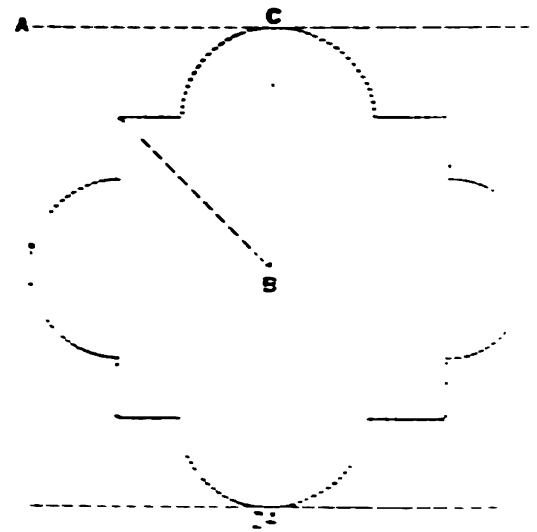
1. Fold the same as for the last exercise.

The drawing of this exercise is so simple that no explanation is needed.



40

NORMAL YELLOW



Orange Yellow.

This color recalls a class of flowers that are fond of bright sunlight, flowers that challenge rather than invite our attention. Among the conspicuous yellow flowers are the golden-rods, sunflowers, dandelions, buttercups, yellow pond lilies, nasturtiums, and the blossoms of many other familiar plants. This color is also prominent in many kinds of fruit and vegetables. Some beautiful effects of orange yellow are often seen in sunsets.

Orange Yellow is an advancing and an exciting color; it is also classed as a warm color.

The Greeks used orange yellow designs on a black ground, interspersed with a smaller pattern of blue green, in a pleasing manner, although blue green with orange yellow is considered by colorists to be a very poor combination. But in most combinations of colors quite as much depends upon the tone of the colors used, and the quantity of each, as in the colors themselves.

The complementary color of orange yellow is blue.

To draw the Diaper Element.

1. Draw a square of the required size.
2. Draw its diagonals.
3. Draw its diameters.
4. Draw the curves that form the lower sides of the lobes.
5. Draw the tops of the side points of the lobes.
6. Draw the outer end points.

These lines should be drawn lightly at first and strengthened afterward.

Green Yellow.

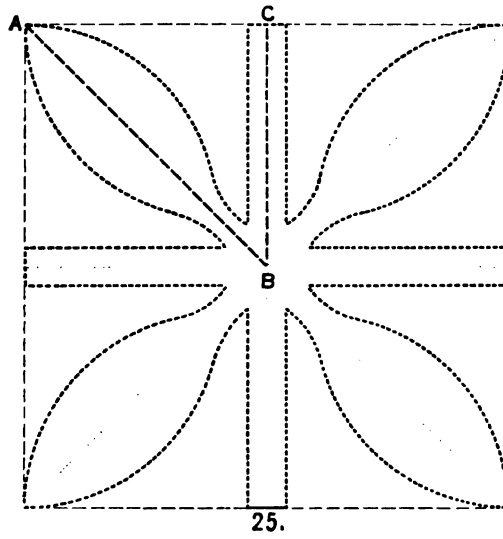
This is a hue of yellow, being produced in the pigmentary colors by the addition of a little green to yellow. This color suggests ripe apples, cool shades, and sun-lit foliage. Although common in plant forms, it is seldom met with in flowers. A few insects are of a green yellow color, but it is a color that is confined chiefly to foliage.

It is one of the retiring restful colors, and for that reason it forms an excellent background in art and decoration to bring out the effects of orange red and violet, of which it is the opposite. It is nature's background for the display of many brilliant effects, but used alone its effect is negative, and is seldom satisfactory when used in large quantities in dress or interior decoration.

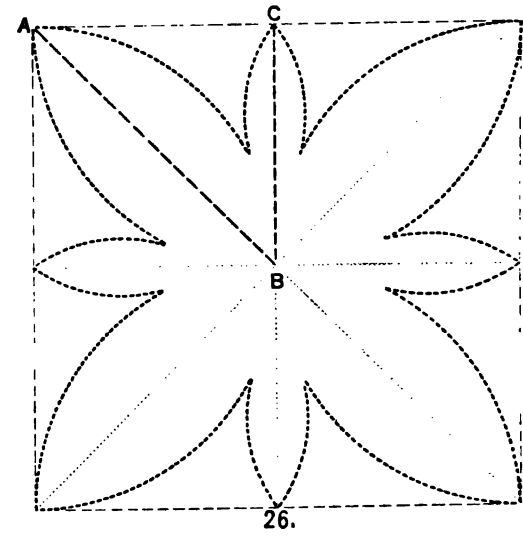
As light is the source of all color, we quite naturally look for the brightest flowers and the most gaily-plumed birds in the warm, bright countries lying near the equator, and fewer varieties, and less brilliancy as we approach the polar regions, and in this we are not disappointed. Nature wears her brightest colors in the sunshine regions, and during the sunshine season, and dresses in her sombre working garb where the heat and light are less intense.

To draw the Modified Quatrefoil.

1. Draw the square and its diagonals and diameters, as in the last exercise.
2. Draw the small inner square complete.
3. Draw the semi-circles between the outer and the inner squares.
4. Strengthen the parts that form the design.



NORMAL GREEN.



Yellow Green.

Yellow Green is the chief color of nature in early spring ; later in the season it is the color of much of the green when in sunlight. This is the color of nature in her best mood, and we consequently associate with it the thought of life and cheerfulness. In autumn, too, the greens that were so intense in summer, are again subdued with yellow. There are many kinds of leaves that suggest this color, but very few that approach it in brightness.

Although yellow green is a strong color, it has been used more successfully and more generally in decoration work than pure green.

The Egyptians combined it with blue and red in many of their ornaments ; they usually, however, relieved it with markings of white, gray or black.

In Byzantine art it was used with orange, red and yellow quite effectively.

To cut the Pattern.

1. Fold the opposite corners of the square together, color side in.
2. Fold the opposite corners together again.
3. Fold the same way a third time. These folds will make a right-angled triangle of eight thicknesses.
4. Mark out with a pencil upon the raw corner one-eighth of the design.
5. Cut the pattern as marked out through all the folds.
6. Mount the design in the given square.
7. Draw it in the space below.

Blue Green.

Blue Green is a difficult color to remember, unless it has been fixed in the mind by the aid of suitable illustrations, and there are not many good specimens of it either in art or nature.

The elytra, or outer wings of some beetles, and the plumage of many birds, are beautiful specimens of blue green.

The greens of the distant woods often have a blue-green appearance, caused by particles of moisture in the atmosphere.

Water colors, the aniline colors and diamond dyes furnish useful helps in the study of color, as many varieties of hue and tone may be produced by suitably mixing two or more colors.

Blue-green, gold and red, combine well, especially when the red is in small quantities.

Green is a favorite color in Turkish decoration, and blue-green and black are used in many of their designs.

Blue-green, blue and deep subdued yellow are often used together in Moresque art ; the Persians also used blue-green with blue and gold.

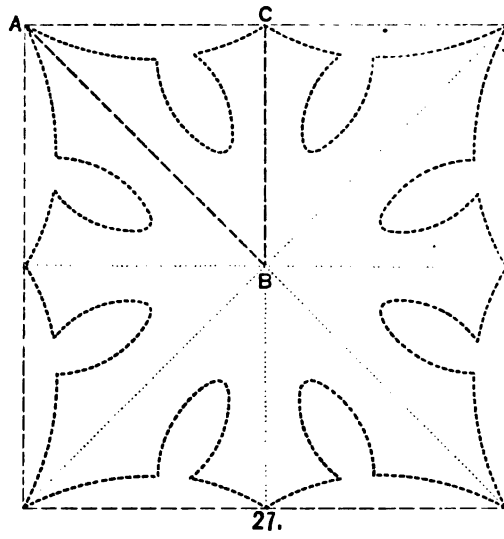
To cut the Pattern.

Proceed as directed for yellow green.

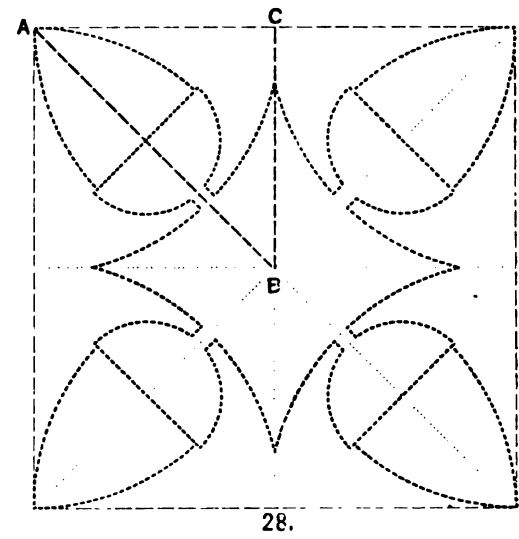
To mount these patterns use only slight touches of liquid glue upon the points of the design, and far enough from the margin that they may be adjusted to fit the square without soiling the paper upon which they are mounted.

To draw the Pattern.

1. The diagonals of the square.
2. The diameters of the square.
3. The V-shaped figures on the diameters.
4. The small lobes, of which the V's form a part.
5. The center, or large lobes.



NORMAL BLUE.



Green Blue.

This color will be studied most satisfactorily by first mounting samples of it upon backgrounds of different colors; in this way its peculiar hue may be impressed, then it can easily be firmly fixed by using it in making simple designs.

Green Blue is not a common color in nature; a few flowers, some beetles and other insects closely approximate it, and distant hills and foliage occasionally suggest it, although

distance is usually more inclined to violet than to blue.

It is, however, used in decoration to quite an extent, especially when it is subdued by association with some other color.

The effect of this color upon the sight and mind is one of repose.

If a little case is procured, it may be home made, in which to keep a collection of insects, they may be made useful in many ways, especially in calling attention to the beautiful colors of many natural objects. To get the greatest benefit from such a collection, the various objects should be correctly named and enclosed under a glass so that they may be seen at any time, but not handled.

Harris's *Insects Injurious to Vegetation* will be found a useful book in the study of insects.

To fold and cut the Pattern.

1. Fold the opposite corners of the square together, color side in.
2. Fold the opposite corners together again.
3. Fold the same way a third time. These folds will make a right-angled triangle of eight thicknesses of paper.
4. Mark out with a pencil on the raw corner, one-eighth of the design.
5. Cut the patterns as marked out, through all the folds.
6. Mount the design in the given square.
7. Draw it in the space below.

Violet Blue.

It is only by constant association with, and handling of the various colors, that we learn to recognize and appreciate them; for this reason, the more ways in which we use them, the greater will be our familiarity with them, always, however, being careful to keep the design as simple as possible, and the combination entirely free from gaudiness.

Although we are constantly directed to nature for the study of the harmonious use of colors, we must bear in mind that what is often beautiful in nature is not always so satisfactory in art. Nature uses the various tones and hues of green in profusion, and with the most pleasing results, and still green is a difficult color to use in decoration.

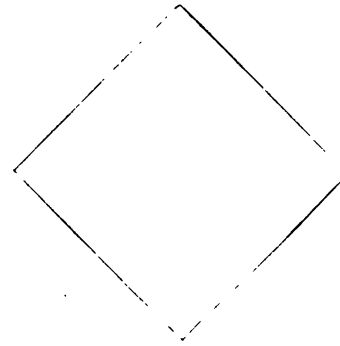
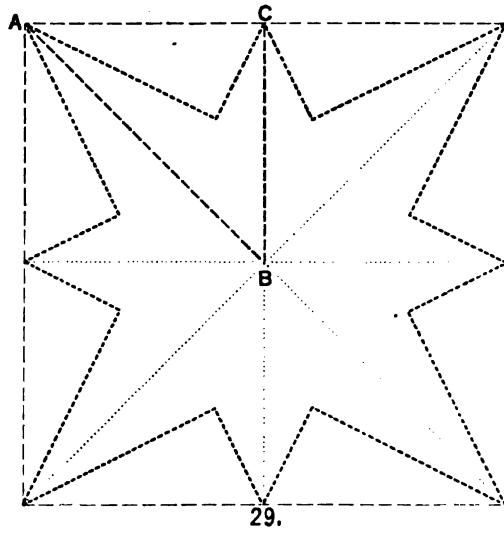
But even in nature the various greens are often nicely adjusted to harmonize with the colors of the flowers with which they are associated.

In nature, green is the common background for most of the bright colors; the birds that carol in our trees, the insects that flit about our plants, and the flowers that adorn our fields and woods, are all made more beautiful in appearance by this common setting. As the greens in nature are often to us merely the backgrounds to enhance the beauty of rarer gems of nature's coloring, so in the decoration of a room, the colors should be those that will form the most satisfactory background for those who occupy it.

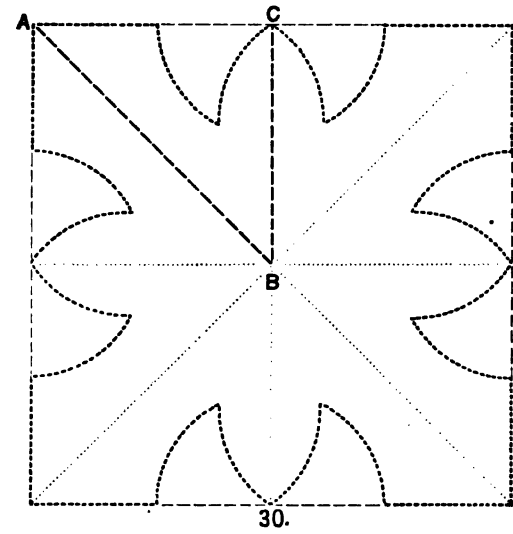
Although violet blue is more easily handled in dress and decoration than is green, still its intensity restricts its application to limited areas, and any combination of colors would better contain too little of it than too much.

To fold and cut the Pattern.

Follow the directions given for the preceding exercise.



NORMAL VIOLET.



Blue Violet.

Blue Violet is a violet color with a preponderance of blue. The fleur-de-lis or common blue flag is often found with beautiful colorings of blue violet. A search for flowers of this color during spring and summer will be rewarded not only with many pleasing specimens, but also with delightful recollections of happy hours spent in the search.

Study this color in association with blue, red and violet.

This is not an uncommon color among flowers, and it is often used in ornament and dress very satisfactorily. When various tones are used for the different parts of the composition a perfectly safe arrangement in harmony may be made.

There are also other colors that may be combined with it to advantage; for instance, a small pattern of a tint of red, which, by the way, should be edged with black; a tint of blue-green also harmonizes with it. There are some combinations made with this color that are condemned by colorists that are nevertheless very pleasing in effect, and are frequently used in decorative work, which shows that in art as well as in nature,

"That which proves
Strong poison unto one, another loves
And takes and lives; thus hemlock juice prevails,
And kills a man, but fattens goats and quails"

To fold and draw the Pattern.

1. Fold the opposite corners together.
2. Fold again in the same way.
3. Fold the same way a third time; this will make a right-angled triangle of eight thicknesses of paper.
4. Mark out with a pencil upon the raw corner one-eighth of the design.
5. Cut the patterns as marked out through all the folds.

Red Violet.

Red Violet is much the same as purple in color, and an illustration of red violet is needed to form an intelligent conception of its appearance. Slight effects of it are found in a few flowers and fruits and in some foliage plants, but any reference to these, without the standard red violet as a guide, would be misleading.

Red violet and orange harmonize.

The complementary color of red violet is yellow green.

The purpose of color, whether in nature or in art, is to beautify and make more attractive the objects to which it is applied. It is usually the color of an object that first attracts attention, and although the object may be perfect in form and adaptability, if its color is faulty it is at once condemned. Aside from the general interest in the colors used in picture painting, it is always the aim of the artist to have a center of interest in his picture, either of color or of form, towards which the eye of the observer will instinctively travel, and the artist often uses all of his resources to lead the attention in that direction. The rest of the picture is often merely a setting, a background, to emphasize this particular point, and care is taken that no other point of the picture shall be equally attractive.

This same principle is followed out in dress. In this case it is usually the face that is made the center of interest, and a great deal of care is usually taken that the attention shall not be attracted elsewhere.

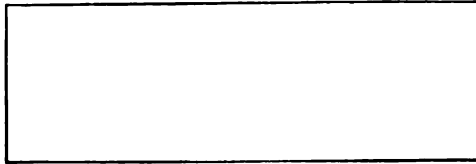
Whenever any feature, either of color, design or arrangement, takes the attention from this main point of interest, the fundamental principle of good designing has been violated.

For this reason the utmost care is usually taken in selecting colors for dress, to choose such as will improve the appearance of the face rather than attract attention to themselves.

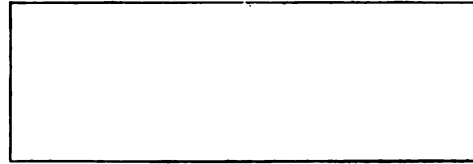
To fold and cut the Pattern.

The various steps in the cutting and folding of this pattern are just the same as for the preceding exercise.

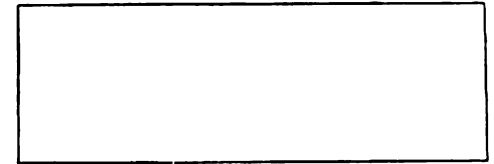
SCALE OF THE NORMAL COLORS AND THEIR HUES.—TO FOLLOW THE STUDY OF THE HUES.



VIOLET RED.



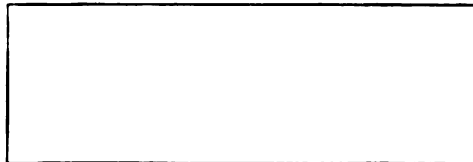
RED ORANGE.



ORANGE YELLOW.



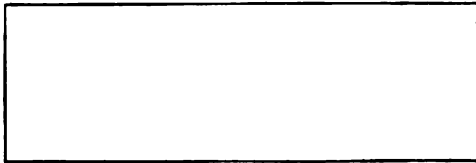
NORMAL RED.



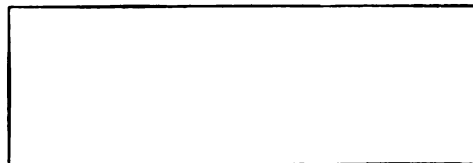
NORMAL ORANGE.



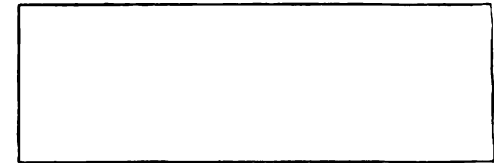
NORMAL YELLOW.



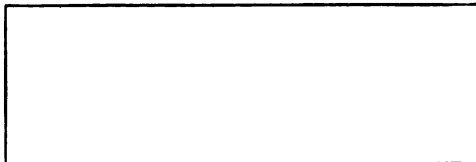
ORANGE RED.
Red and its Hues.



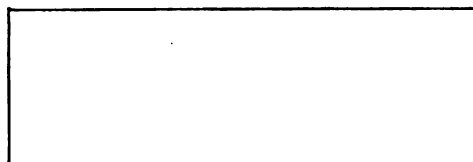
YELLOW ORANGE.
Orange and its Hues.



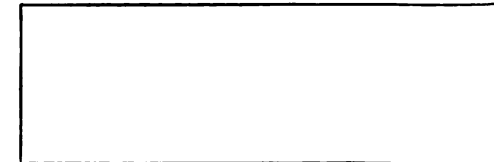
GREEN YELLOW.
Yellow and its Hues



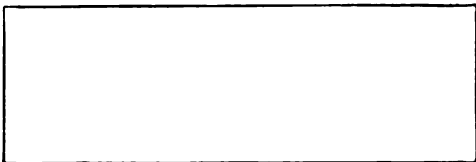
YELLOW GREEN.



GREEN BLUE.



BLUE VIOLET.



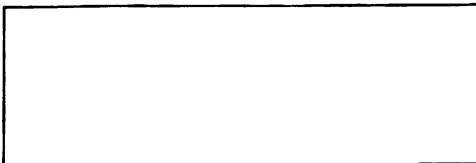
NORMAL GREEN.



NORMAL BLUE.



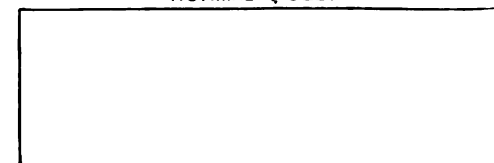
NORMAL VIOLET.



BLUE GREEN.
Green and its Hues.



VIOLET BLUE.
Blue and its Hues.



RED VIOLET.
Violet and its Hues.

HARMONY OF COLORS.

The Harmony of Colors.

There are two main aims in the study of color; the first is to become so familiar with it that we shall thoroughly appreciate and enjoy it when we meet with it in nature or art; and the other is the acquirement of such a knowledge of the laws that control the harmonious combinations of colors, that we may use them most effectively.

The success of the first aim depends almost entirely upon being brought in pleasant contact with objects whose chief beauty is their color; the second, by ascertaining the underlying principles that control the beauty of such objects.

Our first efforts at the harmonious combination of colors are influenced almost entirely by our taste, and but little is done under the guidance of fixed rules, but when we begin to question the correctness of our taste, we feel the need of some fundamental principles upon which to base our judgment.

Our experience with hap-hazard combinations soon convinces us that some colors combine much more satisfactorily than other colors do, and the laws given for our guidance in the harmonious use of colors, are the results of the experience of those who have given the subject the most thorough study.

There are several different methods of classifying colors and color effects, but the ultimate aim of all is the same, —the putting together of different colors so that they shall form harmonious combinations.

Chevreul divides the harmony of colors into six divisions, under two general heads, as follows:—

First Kind.

HARMONIES OF ANALOGOUS COLORS.

1. "The *harmony of scale*, produced by the simultaneous view of different tones of a single scale, more or less approximating.
2. The *harmony of hues*, produced by the simultaneous view of tones of the same height, or nearly so, belonging to scales more or less approximating.
3. The *harmony of a dominant colored light*, produced by the simultaneous view of different colors, assorted conformably to the law of contrast, but one of them predominating, as would result from seeing these colors through a slightly stained glass.

Second Kind.

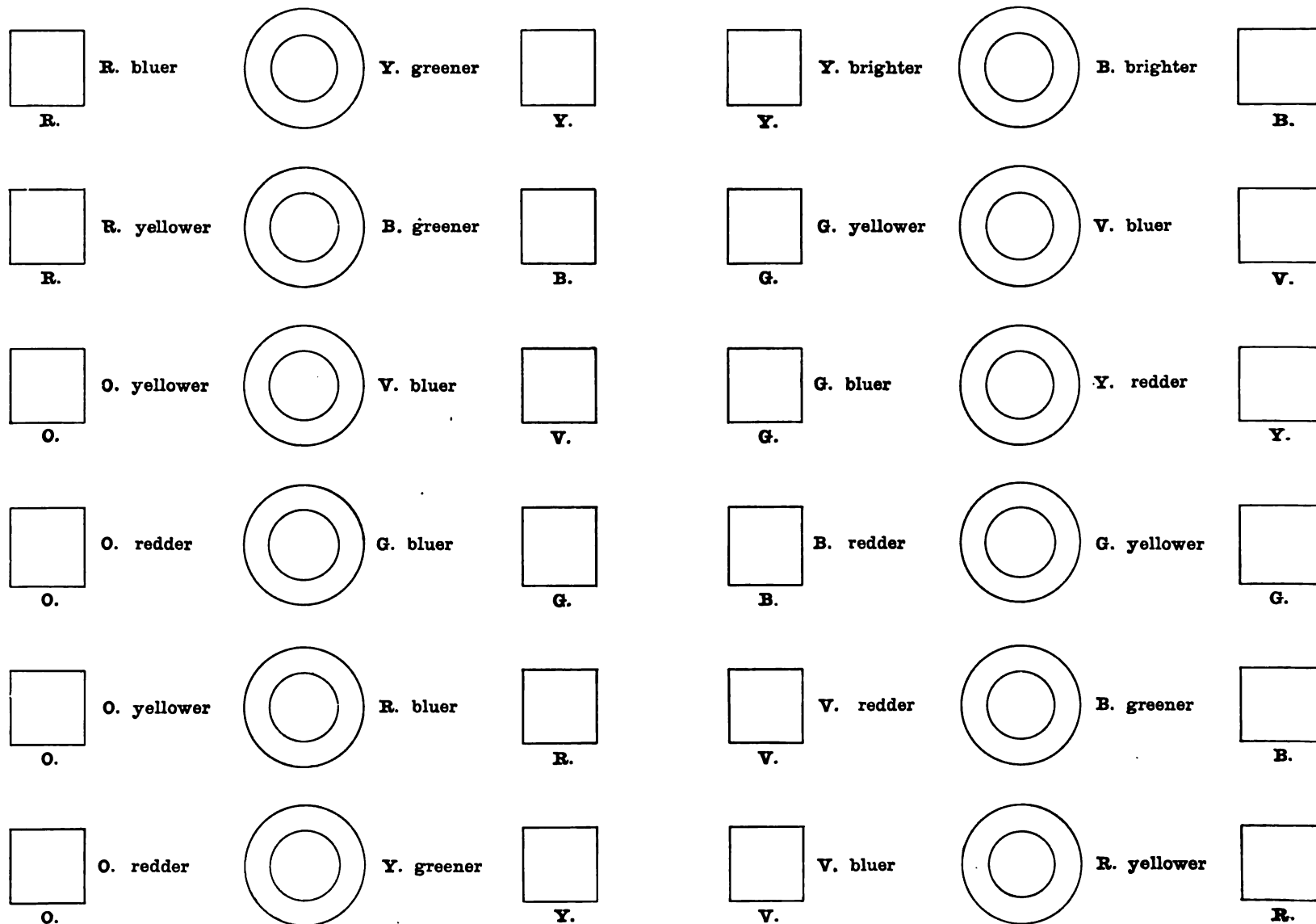
HARMONIES OF CONTRASTS.

1. The *harmony of contrast of scale*, produced by the simultaneous view of two tones of the same scale, very distant from each other.
2. The *harmony of contrast of hues*, produced by the simultaneous view of colors belonging to scales very far asunder, assorted according to the law of contrast. The difference in height of juxtaposed tones may also augment the contrast of colors."

No color can be viewed without another color being created by the eye; thus, if red is viewed, the eye creates for itself green, and this green is cast upon whatever is near. If green is viewed, red is in like manner created and cast upon adjacent objects; thus, if red and green are juxtaposed, each creates the other in the eye, and the red created by the green is cast upon the red, and the green created by the red is cast upon the green; and the red and the green become improved by being juxtaposed. Chevreul thoroughly investigated this and the various other phenomena connected with the contrast of colors, and he has classed them under these three heads: *simultaneous contrast*, *successive contrast* and *mixed contrast*.

SIMULTANEOUS CONTRASTS.

Showing how colors are affected in hue or tone by association with other colors.



Simultaneous Contrast.

"In the *simultaneous contrast of colors* is included all the phenomena of modification, which differently colored objects seem to undergo in their physical composition and in the height of tone of their respective colors, when seen simultaneously."

This is a contrast that is produced by the effect that a color, tone or hue, has upon another color, tone or hue. It is subdivided into

Contrast of Tone,

Contrast of Hue and

Contrast of Color.

Contrast of Tone. This contrast is easily illustrated by taking two strips of gray paper, of different intensities, and placing them side by side. The effect will be to make the light slip appear lighter than it really is, and the dark slip darker. This difference is most noticeable along the line of contact, and the effect will be less apparent as the surfaces recede from this line; the light slip becoming gradually darker in appearance and the dark slip lighter. This apparent difference in the intensity of tone, caused by contact with a tone that is lighter than itself, is called *Contrast of Tone*.

"Contrast of tone occurs with the colors, properly so called, as well as with gray."

Contrast of Hue. To see the effect caused by placing different colors or hues in contrast, cut two small circles of red, and place one upon a sheet of yellow paper and the other upon a sheet of blue-green. The one upon the yellow will appear bluer or more violet than before, and the one upon the blue-green will appear yellower than its actual color. This effect is called *Contrast of Hue*.

This contrast enters into all combinations of colors, as a color always borrows a little from the color adjacent to it. In this way both colors are influenced to some extent, and the aim in color work is to combine such colors as will benefit rather than injure one another.

Contrast of Color. The combined modification in tone caused by contrast of intensity and the modification of the hue of a color, caused by contrast with another color, produces *Simultaneous Contrast of Color*.

Rood gives this list of modifications; it is slightly different from that given by Chevreul.

Pairs of Colors.	Change due to Contrast.
1. Red and Orange.....	{ The Red becomes more purplish. The Orange becomes more yellowish.
2. Red and Yellow.....	{ The Red becomes more purplish. The Yellow becomes more greenish.
3. Red and Blue Green	{ The Red becomes more brilliant. The Blue Green becomes more brilliant.
4. Red and Blue.....	{ The Red becomes more orange-red. The Blue becomes more greenish.
5. Red and Violet.....	{ The Red becomes more orange-red. The Violet becomes more bluish.
6. Orange and Yellow.....	{ The Orange becomes more red-orange. The Yellow becomes more greenish-yellow
7. Orange and Green.....	{ The Orange becomes more red-orange. The Green becomes more bluish-green.
8. Orange and Cyan-blue, (Greenish Blue.)	{ The Orange becomes more brilliant. The Cyan-blue becomes more brilliant.
9. Orange and Violet.....	{ The Orange becomes more yellowish. The Violet becomes more bluish.
10. Yellow and Green.....	{ The Yellow becomes more orange-yellow. The Green becomes more bluish-green.
11. Yellow and Cyan-blue.....	{ The Yellow becomes more orange-yellow. The Cyan-blue becomes more blue.
12. Yellow and Ultramarine Blue..	{ The Yellow becomes more brilliant. The Ult.-blue becomes more brilliant.
13. Green and Blue.....	{ The Green becomes more yellowish-green. The Blue becomes purplish.
14. Green and Violet.....	{ The Green becomes more yellowish-green The Violet becomes more purplish.
15. Greenish-yellow and Violet....	{ The Greenish-yel. becomes more brilliant. The Violet-yel becomes more brilliant.
16. Blue and Violet.....	{ The Blue becomes more greenish. The Violet becomes more purplish.

Successive Contrast.

"The *successive contrast of colors* includes all the phenomena which are observed when the eyes, having looked at one or more colored objects for a certain length of time, perceive, upon turning them away, images of these objects, having the color complementary to that which belongs to each of them."

If we look steadily at any color for a time, and then immediately look at something white, the eye will perceive the contrasting effect of the color looked at. As this color effect succeeds the positive impression, it is called *Successive Contrast*.

Mixed Contrast.

"The distinction of *simultaneous* and *successive* contrast renders it easy to comprehend the phenomenon which we call *mixed contrast*; because it results from the fact that the eye, having seen for a time a certain color, acquiring an aptitude to see for another period the complementary of that color, and also a new color presented to it by an exterior object; the sensation then perceived is that which results from this new color and the complementary of the first."

By the foregoing it will be seen that every color effect is modified, favorably or otherwise, by associating other colors with it. Thus, if black and blue are associated, the complementary of blue, that is, orange yellow, is cast upon the black, which gives it a rusty appearance. In like manner the complementary of the color looked at, is always projected upon the neighboring surface, and affects its color more or less.

Both *Successive Contrast* and *Mixed Contrast* are but variations of *Simultaneous Contrast*.

Harmonious effects in color combinations are produced in various ways, and depend not only upon the different colors that are used in the combination, but also upon the quantity and intensity of each color used.

For the purpose of elementary instruction Mr. Henry T. Bailey has placed all of the harmonies under the following divisions:

Contrasted Harmony.

Dominant Harmony.

Complementary Harmony.

Analogous Harmony.

Perfected Harmony.

This is, however, simply an arbitrary classification, and is useful only so far as it helps to simplify the presentation of the subject to beginners.

Contrasted Harmony is an agreeable combination of any color or tone, that contrasts with white, black, gray, gold or silver.

Dominant Harmony is an agreeable combination of colors produced by using the different tones of one color scale.

Complementary Harmony is an agreeable combination of colors produced by using complementary or opposite colors.

Analogous Harmony is an agreeable combination of colors produced by using those colors that are related to a common basal color.

Perfected Harmony is an agreeable color effect, produced by using colors in such proportions that their admixture will produce, or approximate white, (gray).

HARMONY OF COLORS.—CONTRASTED HARMONY.

Up to this point our work has consisted chiefly as an effort to learn the names of the various colors, their tints, shades and hues, and to cultivate habits of observing colors as found in nature and art, and to develop a love for color.

We are now ready to begin the study of the harmonious application of color; to do this thoroughly, however, is a life work of itself, and too much must not be expected of only a few brief lessons; neither must we think that this subject can be learned in its entirety by fixed rules and good examples alone. These are useful helps, but are limited in their application.

Contrasted Harmony.

Definition. Contrasted harmony is an agreeable combination of any color or tone that contrasts with white, black, gray, gold or silver.

The effect of these upon the colors with which they are combined, is almost neutral, as they do not disturb them in hue or tone but slightly, and are not themselves disturbed by associations with any of the colors. They may therefore be safely used in dress or decoration with any colors without fear of producing a discord.

Borrowed Effects. Although they have so slight a disturbing effect when used in this way, they still exert an influence over the colors with which they are combined; if, for instance, a white pattern is distributed over a colored ground, the ground color will borrow from the white and appear lighter in tone; if it is associated with black it will be influenced by the black and appear darker. By a little experimenting it will be seen that these so-called neutral colors may add to the brilliancy, but may also diminish the intensity of a color.

Size of Tablets. In the study of the harmony of colors, circles or squares, or both combined, have been found the most easily handled forms to use. If these are cut about an inch in diameter, when not more than four are to be used in a row, or about five-eighths or one-half an inch in diameter for designs requiring more than four in a row, the desired effect can be secured most easily. When these circles are mounted they should be separated by intervals of not less than one-half their diameter.

Simplicity in Designs. The tendency of beginners to cut their designs in too many small parts, and to use too many colors, must be overcome by insisting upon simplicity in all of their color combinations.

Suggestions from Chevreul, Owen Jones and others.

WHITE—1. When two colors do not look well together, separate them with white.

2. White heightens the tone of the colors with which it is placed in contrast.

3. The binary association in the order of the greatest beauty is as follows: Light blue and white, rose and white, deep yellow and white, bright green and white, violet and white, orange and white.

4. Colors on a white ground appear darker.

5. Ornaments in any color or in gold may be used on white or black grounds without an edging.

BLACK—1. Black never produces a bad effect when placed between two harmonious colors.

2. Black does not associate so well with a luminous and a sombre color as it does with two luminous colors.

3. The lowering of the tone of a color in contact with black is always perceptible.

4. Black grounds suffer when opposed to colors which give a luminous complementary.

5. Colors on a black ground appear lighter.

6. Black draperies, lowering the tone of colors with which they are in juxtaposition, whiten the skin.

GRAY—1. All the primary colors gain in purity and brilliancy by the proximity of gray.

2. Gray separates colors that do not assort well together.

3. Gray associates more favorably than black, with orange and violet, green and blue, green and violet.

4. Although gray does not produce a bad effect with two luminous colors, yet it is generally inferior to black and to white.

GOLD—1. When ornaments in color are on a gold ground, the ornaments should be separated from the ground by an edging of a darker color.

2. Gold ornaments on any colored ground should be outlined with black.

SILVER—Silver is cool in effect when used with colors, and does not form so pleasing a combination as gold.

HARMONY OF COLORS—DOMINANT HARMONY.

Definition. Dominant Harmony is an agreeable combination of colors produced by using different tones of one color.

This harmony Chevreul calls the Harmony of Scale.

Explanation. Dominant Harmony includes not only the various tones of the normal colors and the hues, but also the tones of gray and of all other color effects, but the mass of each composition must be limited to the tints and shades of but one color.

The strongest tone of the chosen scale is the dominant color of the composition.

Scales of Tones. Below are given two different scales of tones, which will illustrate the principle upon which this harmony is based.

Any of the tones selected from the scale of green will harmonize with each other, and any of the tones selected from the scale of violet red will harmonize with each other; the same with the other normal colors, and the different hues and grays.

Choice of Tones. It must not, however, be inferred that any two tones of a color will harmonize equally well, neither must it be supposed that the chosen tones may always be used in equal quantities, or without regard to the place they are to occupy in the color scheme. These considerations are often of as much importance as the selection of the colors or of the design itself.

As a general rule, the greater difference there is in the depth of tone, or in the intensity of the colors used, the less of the darker tones or of the intense colors should be used.

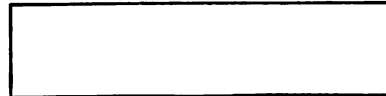
Scale of Green.



LIGHTER GREEN. (Tint 2.)



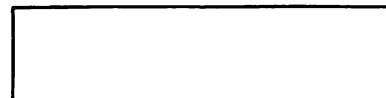
LIGHT GREEN. (Tint 1.)



GREEN.



DARK GREEN. (Shade 1.)

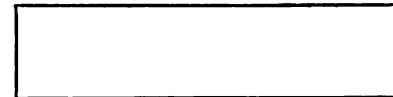


DARKER GREEN. (Shade 2.)

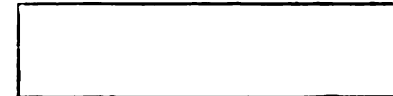
Scale of Violet Red.



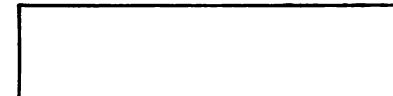
LIGHTER VIOLET RED. (Tint 2.)



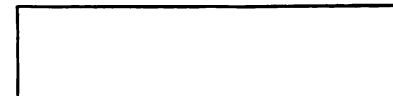
LIGHT VIOLET RED. (Tint 1.)



VIOLET RED.



DARK VIOLET RED. (Shade 1.)



DARKER VIOLET RED. (Shade 2.)

Analogous and Contrasting Tones. The colors that are somewhat alike in hue are called analogous colors, and the tones of a color that are near together in the scale are called analogous tones; those that are far enough apart in the scale to contrast with each other are called contrasting tones. The tones that are near together in the scale, that is, the analogous tones, are most easily harmonized, and produce a softer effect than those that are so far apart as to produce a contrast of intensity.

Combinations. The following are some of the simple combinations of Dominant Harmony in two tones :

Red.

1. Red and Darker Red Shade. (R. and R. S. 2.)
2. Darker Red Tint and Lighter Red Shade. (R. T. 1, and R. S. 1.)

Orange.

3. Orange and Darker Orange Shade. (O. and O. S. 2.)
4. Darker Orange Tint and Darker Orange Shade. (O. T. 1, and O. S. 2.)
5. Lighter Orange Tint and Lighter Orange Shade. (O. T. 2, and O. S. 1.)

Yellow.

6. Yellow and Lighter Yellow Shade. (Y. and Y. S. 1.)
7. Darker Yellow Tint and Lighter Yellow Shade. (Y. T. 1, and Y. S. 1.)
8. Darker Yellow Shade and Lighter Yellow Tint. (Y. S. 2, and Y. T. 2.)

Green

9. Green and Darker Green Tint. (G. and G. T. 1.)
10. Lighter Green Tint and Darker Green Shade. (G. T. 2, and G. S. 2.)
11. Lighter Green Tint and Lighter Green Shade. (G. T. 2, and G. S. 1.)

Blue.

12. Blue and Lighter Blue Tint. (B. and B. T. 2.)
13. Darker Blue Tint and Darker Blue Shade. (B. T. 1, and B. S. 2.)
14. Lighter Blue Shade and Lighter Blue Tint. (B. S. 1, and B. T. 2.)

Violet.

15. Violet and Darker Violet Shade. (V. T. 1, and V. T. 2.)
16. Darker Violet Tint and Lighter Violet Shade. (V. T. 1, and V. T. 1.)
17. Lighter Violet Shade and Lighter Violet Tint. (V. S. 1, and V. T. 2.)

There are a number of pleasing combinations that the different scales of tones of the hues will produce, the following are a few of the many that may be made with two tones :

18. Violet Red and Darker Violet Red Tint. (V. R. and V. R. T. 1.)
19. Lighter Violet Red Tint and Darker Violet Red Shade. (V. R. T. 2, and V. R. S. 2)
20. Darker Violet Red Tint and Darker Violet Red Shade. (V. R. T. 1, and V. R. S. 2.)
21. Green Blue and Lighter Green Blue Tint. (G. B. and G. B. T. 2.)
22. Lighter Green Blue Tint and Lighter Green Blue Shade. (G. B. T. 2, and G. B. S. 1.)

23. Darker Green Blue Shade and Darker Green Blue Tint. (G. B. S. 2, and G. B. T. 1.)
24. Blue Violet and Darker Blue Violet Tint. (B. V. and B. V. T. 1.)
25. Lighter Blue Violet Shade and Lighter Blue Violet Tint. (B. V. S. 1, and B. V. T. 2.)
26. Darker Blue Violet Shade and Lighter Blue Violet Tint. (B. V. S. 2, and B. V. T. 2.)

The following combinations in three tones will be found pleasing in effect :

27. Red, R. T. 2., R. S. 2., R. T. 2., R., R. T. 2., R. S. 2., R. T. 2., R.
28. R. T. 2., R., R. S. 1., R., R. T. 5., R., R. S. 1., R., R. T. 2.
29. Orange, O. T. 1., O. S. 2., O. T. 1., O., O. T. 1., O. S. 2., O. T. 1., O.
30. O. S. 1., O. S. 2., O., O. S. 2., O. S. 1., O. S. 2., O., O. S. 2., O. S. 1.
31. Yellow, Y. T. 2., Y. S. 2., Y. T. 3., Y., Y. T. 2., Y. S. 2., Y. T. 2., Y.
32. Y. T. 2., Y. T. 1., Y., Y. T. 1., Y. T. 2., Y. T. 1., Y., Y. T. 1., Y. T. 2.
33. Green, G. T. 2., G. S. 2., G. T. 2., G., G. T. 2., G. S. 2., G. T. 2., G.
34. G. T. 2., G., G. S. 2., G., G. T. 2., G., G. S. 2., G., G. T. 2.
35. Blue, B. T. 2., B. S. 2., B. T. 2., B., B. T. 2., B. S. 2., B. T. 2., B.
36. B. T. 2., B. T. 1., B., B. T. 1., B. T. 2., B. T. 1., B., B. T. 1., B. T. 2.
37. Violet, V. T. 2., V. S. 2., V. T. 2., V., V. T. 2., V. S. 2., V. T. 2., V.
38. V. T. 2., V. T. 1., V., V. T. 1., V. T. 2., V. T. 1., N., V. T. 1., V. T. 2.

When, as in these cases, more than two tones or two colors are used, the circles should not be much more than half an inch in diameter, and they should be at least half a diameter apart.

If these are arranged nine in a row, those at the two ends will be alike in tone, which will give the row a balanced effect. The initials of the colors are given in the order in which they should be arranged.

Many of the harmonies that are produced by uniting the different tones of the same color are weak and wanting in effect, unless they are enlivened with touches of other harmonious colors. Those of a complementary contrast are usually the most satisfactory for this purpose. The introduction of these enlivening touches of color is allowable in all compositions of color work, as is also the use of the neutral colors, white, black, gray, gold and silver.

HARMONY OF COLORS—COMPLEMENTARY HARMONY.

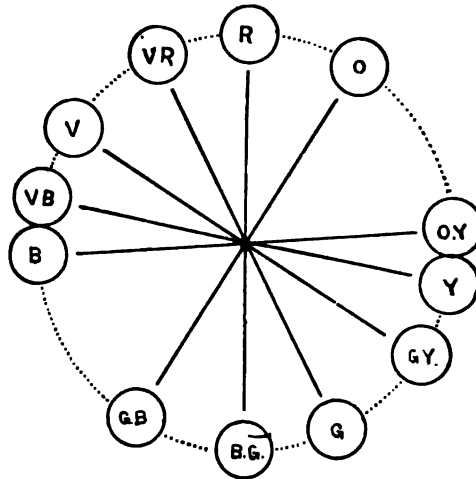
Definition. Complementary harmony is an agreeable combination of colors produced by using complementary or opposite colors.

Explanation. Any two colors, which by their union produce, or closely approximate white (gray), are called complementary.

It is easily shown by the aid of a prism, that pure light, that is, white sunlight, may be separated into the colors of the solar spectrum, viz: into red, orange, yellow, green, blue, and violet, and it is generally understood that these colors are the elements of which white light is composed. The absence then, of one or more of these colors deprives the light of its whiteness. It is therefore quite evident that for every color, there must be some other color or colors which, if added to it, will produce white. The color that is wanting in a given color in order to restore it to pure whiteness, is its complement, and is therefore called its *complementary color*.

If we take all the colors of the solar spectrum and separate them in any way into two divisions, the combined colors of one division will be complementary to the combined colors of the other division.

For convenience the various colors are often arranged in a circle in their due proportions, or with their due intervals, as shown below; the complementary color is then directly opposite the given color, and it is for this reason often called its *opposite color*.



Complementary Contrasts.

By this illustration it will be seen that red is the opposite or complementary color of blue green, and that blue green is the complementary color of red; this is the same in every case, the two colors that will produce white when mingled, are complementary, one of the other.

These are also called *contrasting colors*, because they are just the opposite of one another in effect.

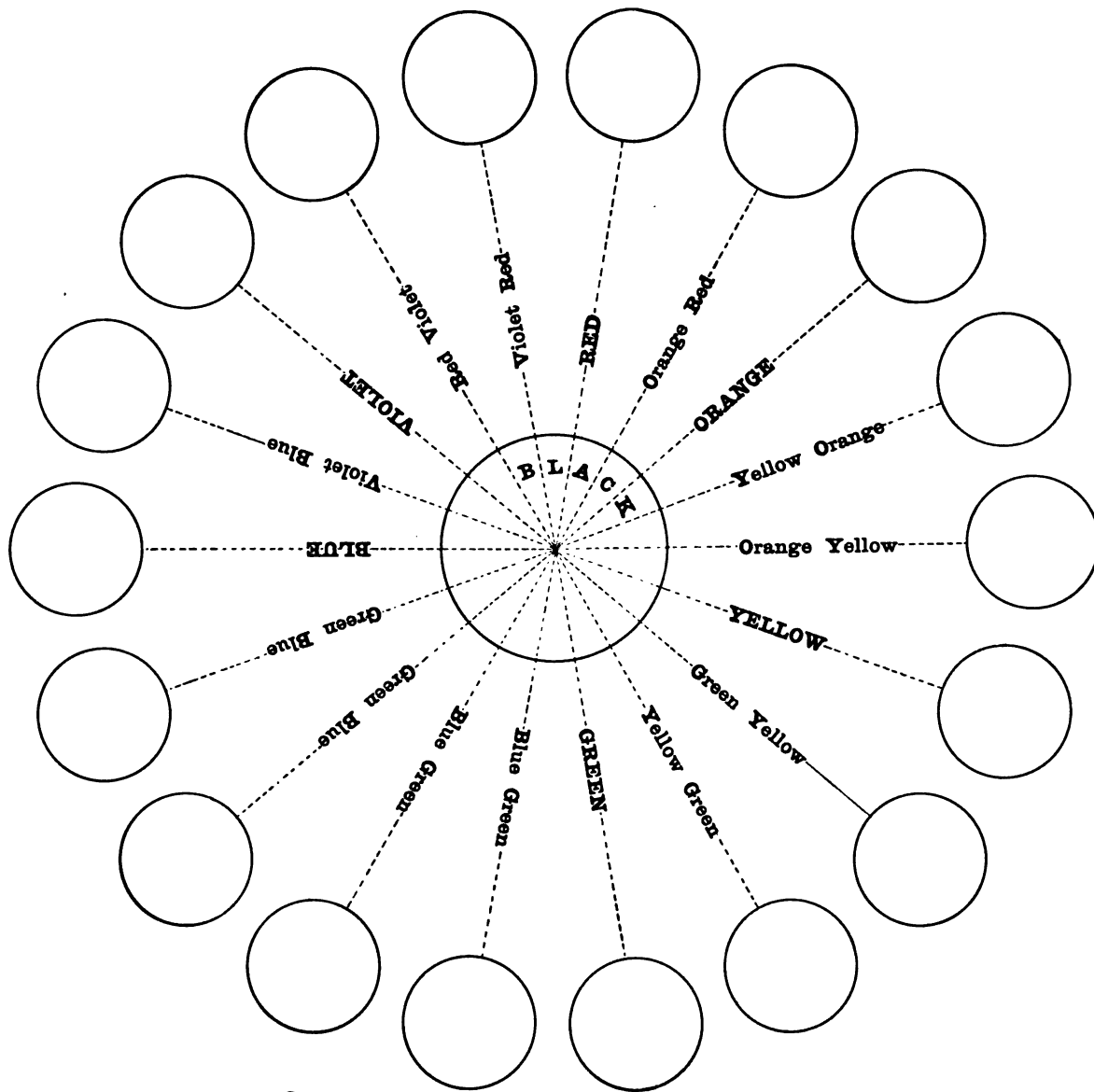
They are sometimes spoken of as *accidental colors*, because, after the eye has become fatigued by looking at a given color, and is then turned to a sheet of white paper or other white surface, a colored spot is seen that is the exact opposite or complement of the color looked at.

While there is but one complementary color for each definite degree of intensity, and for each definite hue, there are so many possible variations of each color, and as each has a complementary color of its own, the number of complementaries of a color is almost unlimited.

It must not be inferred that the complementary of a color is always a satisfactory harmony with it. Our best colorists avoid some of these combinations, because of the unsatisfactory effect they produce when used together. Neither do the best complementary harmonies depend upon the use of the complementaries in the proportions required to produce white. A tint of a color, with a shade of its complementary, is often more pleasing in effect than when they are used in their full intensities.

Black, white, gray, gold, and silver, may be used with any of these harmonies, but gold and silver must be used with care and discretion, as they are likely to make elementary designs look gaudy.

An edging of some sort is, however, indispensable in many combinations of colors in order to prevent a borrowing or a swimming effect, and to preserve the true hue and tone of the associated colors, for, as Wilkinson says: "The great point in ornamenting with colors is to keep them distinct, and to seek *effect*, not *confusion*, from their combinations."



Complementary Contrasts.

When the various colors and their hues are arranged in a circle, as shown on the preceding page, the pairs of complementary colors are those opposite each other, and if the colors used are to be complementaries, they must in every case be those that are directly opposite each other in the circle of complementary contrast. There are, however, some very pleasing color effects produced by selecting colors that are found nearer together than this. In Analogous Harmony, for instance, the colors are closely related in hue and are consequently very near together in the color circle, but just as soon as the limit of Analogous Harmony is passed, scarcely any of the possible combinations are satisfactory until the hues of the complementary colors are reached, when the beauty and the intensity of the opposed colors are increased by contrast. When pale and dark colors that are not complementary to each other are used together, both colors are usually affected in two ways; in the first place the pale colors appear paler, and the dark colors appear darker by the contrast; and secondly, both of the colors are influenced in hue by simultaneous contrast, as shown in the table of modifications given on page 41.

In studying the harmony of colors it is advisable to give particular attention to the effect of simultaneous contrast, as it enters so largely into every combination of colors, and it is an easy matter to injure two colors that are both beautiful in themselves, by putting them together in color arrangements where they mutually borrow from each other to the injury of both. The influence of association of such colors is just the same as looking at a color through a very faintly colored glass that is of the complementary of the associated color. Thus, if blue-green and red are used together, the complementary of blue-green is red, and if we look at red through red glass, the red appears more intense in color and is thus improved; and the complementary of red is blue-green, and this color seen through blue-green glass is also intensified in tone, so that both are improved by the association. This is what is understood by simultaneous contrast, the effect of which is to improve all complementary contrasting colors.

Contrasting Colors.

The following list of contrasting colors gives the complementaries of the six spectral colors and two of the hues of each color.

Red.

1. Violet Red and Green,
2. Red and Blue Green,
3. Orange Red and Blue Green.

Orange.

4. Red Orange and Blue Green,
5. Orange and Blue Green,
6. Yellow Orange and Green Blue.

Yellow.

7. Orange Yellow and Green Blue,
8. Yellow and Violet Blue,
9. Green Yellow and Violet.

Green.

10. Yellow Green and Red Violet,
11. Green and Violet Red,
12. Blue Green and Red.

Blue.

13. Green Blue and Yellow Orange,
14. Blue and Yellow,
15. Violet Blue and Green Yellow.

Violet.

16. Blue Violet and Green Yellow,
17. Violet and Green Yellow
18. Red Violet and Yellow Green.

In the colors, Red, Orange Red, Red Orange and Orange, all of which are shown as having Blue Green for complementaries, the hue of the Blue Green will vary towards Green Blue as the hues approach the Orange. In the same way the different Green Yellows will vary towards Green as their complementaries become warmer in hue.

HARMONY OF COLORS—ANALOGOUS HARMONY.

"Forbid two hostile colors close to meet,
But win with middle tints their union sweet."

Definition. Analogous harmony is an agreeable combination of colors produced by using those colors that are related to a common basal color.

Explanation. By analogous colors are understood those colors that are closely similar, but that differ slightly in hue or tone; thus the different tones of a scale of tones of any color, are analogous, as are also the different tones of the hues of that color.

This harmony is nearly equivalent to Chevreul's Harmony of Hues.

The colors used in this harmony may vary in hue and tone to any degree that does not carry them into another color family.

Below are given the Normal Blue and its analogous colors. See also the scale of Green on page 8.

Scale of Green Blue.	Scale of Blue.	Scale of Violet Blue.
Lighter Green Blue,	Lighter Blue,	Lighter Violet Blue,
Light Green Blue,	Light Blue,	Light Violet Blue,
Green Blue,	Blue,	Violet Blue,
Dark Green Blue,	Dark Blue,	Dark Violet Blue,
Darker Green Blue.	Darker Blue.	Darker Violet Blue.

Scale of Hues and Tones of Blue.

All of the tones of analogous scales do not combine equally well; some combinations are very pleasing in effect, some need a third or a neutral color to make them harmonize satisfactorily, and some of the combinations that may be made with analogous hues are harsh and discordant. So it is not safe to combine analogous colors at random, with the thought that they must combine well because they are analogous. As a general thing a contrast of tone, that is, the tints of one of the scales of tones or hues of color, and the shades of one of its analogous scales, combine better than do the tints when used alone.

Chevreul, in his *Harmony and Contrast of Colors*, divides harmonies of analogous colors into three divisions, viz:

1. "The Harmony of scale, produced by the simultaneous view of different tones of a color scale, more or less approximating."
2. "The Harmony of hues, produced by the simultaneous view of tones of the same height, or nearly so, belonging to scales more or less approximating."
3. "The Harmony of a dominant colored light, produced by the simultaneous view of different colors assorted conformably to the law of contrast, but one of them predominating, as would result from seeing these colors through a slightly stained glass."

The following are some of the satisfactory combinations in two and three tones:

Red.

1. Lighter Orange Red Shade and Darker Red Shade. (O. R. S. 1, and R. S. 2)
2. Lighter Orange Red Tint and Lighter Red Shade. (O. R. T. 1, and R. S. 1.)
3. Darker Violet Red Shade and Lighter Violet Red Tint. (V. R. S. 2, and V. R. T. 1)
4. Lighter Red Tint and Darker Orange Red Tint. (R. T. 2, and O. R. T. 1.)
5. Lighter Red Shade and Lighter Orange Red Tint. (R. S. 1, and O. R. T. 2.)
6. O. R. T. 2, O. R. S. 1, R. S. 2, O. R. S. 1, O. R. T. 2.
7. R. S. 2, O. R. 2, R; O. R. T. 2, R. S. 2.

Orange.

8. Lighter Orange Shade and Darker Yellow Orange Tint. (O. S. 2, and Y. O. T. 1.)
9. Darker Red Orange Tint and Lighter Orange Tint. (R. O. T. 1, and O. T. 2)
10. Darker Red Orange Shade and Darker Orange Tint. (R. O. S. 2, and O. T. 1.)

11. Darker Yellow Orange Shade and Darker Yellow Orange Tint. (Y. O. S. 2, and Y. O. T. 1.)
12. Darker Red Orange Shade and Yellow Orange. (R. O. S. 2, and Y. O.)
13. Lighter Orange Tint and Lighter Red Orange Shade. (Y. O. T. 2, and R. O. S. 1.)

Yellow.

14. Lighter Yellow Shade and Darker Yellow Tint. (Y. S. 1, and Y. T. 1.)
15. Lighter Yellow Tint and Darker Orange Yellow Shade. (Y. T. 2, and O. Y. S. 2.)
16. Green Yellow and Yellow. (G. Y. and Y.)
17. Lighter Yellow Tint and Lighter Green Yellow Shade. (Y. T. 2, and G. Y. S. 1.)
18. Darker Green Yellow Shade and Lighter Orange Yellow Tint. (G. Y. S. 2, and O. Y. T. 2.)
19. Lighter Green Yellow Tint and Darker Green Yellow Shade. (G. Y. T. 2, and G. Y. S. 2.)
20. Y. S. 2, G. Y. T. 2, Y.; G. Y. T. 2, Y. S. 2.
21. O. Y. S. 1, Y. T. 1, G. Y. S. 2; Y. T. 1, O. Y. S. 1.)

Green.

22. Darker Blue Green Shade and Lighter Green Blue Tint. (B. G. S. 2, and G. T. 2.)
23. Darker Blue Green Tint and Lighter Blue Green Shade. (B. G. T. 1, and B. G. S. 1.)
24. Lighter Blue Green Shade and Lighter Yellow Green Tint. (B. G. S. 1, and Y. G. T. 2.)
25. Darker Yellow Green Tint and Darker Green Shade. (Y. G. T. 1, and G. S. 2.)

26. Lighter Green Shade and Yellow Green. (G. S. 1, and Y. G.)
27. Lighter Yellow Green Tint and Blue Green. (Y. G. T. 2, and B. G.)
28. G. T. 1, G. T. 2, B. G. S. 2; Y. G. T. 2, G. T. 1.
29. G. T. 2, Y. G., B. G. S. 1; Y. G., G. T. 2.

Blue.

30. Lighter Green Blue Tint and Darker Violet Blue Shade. (G. B. T. 2, and V. B. S. 2.)
31. Darker Green Blue Shade and Lighter Blue Tint. (G. B. S. 2, and B. T. 2.)
32. Lighter Blue Shade and Darker Blue Tint. (B. S. 1, and B. T. 1.)
33. Darker Blue Shade and Lighter Violet Blue Tint. (B. S. 2, and V. B. T. 2.)

Violet.

34. Darker Violet Tint and Lighter Red Violet Shade. (V. T. 1. and R. V. S. 1.)
35. Darker Violet Shade and Lighter Blue Violet Tint. (V. S. 2, and B. V. T. 1.)
36. Lighter Violet Tint and Darker Red Violet Shade. (V. T. 2, and R. V. S. 2.)
37. Violet and Darker Red Violet Tint. (V. and R. V. T. 1.)
38. Lighter Blue Violet Tint and Darker Blue Violet Shade. (B. V. T. 2, and B. V. S. 2.)
39. Darker Violet Shade and Darker Blue Violet Tint. (V. S. 2, and B. V. T. 1.)
40. V., B. V. T. 2, R. V. S. 2; B. V. T. 2, V.
41. R. V. R. V. T. 1, B. V. S. 2; R. V. T. 1, R. V.

HARMONY OF COLORS—PERFECTED HARMONY.

Definition. Perfected Harmony is an agreeable color effect, produced by using colors in such proportions that their admixture will produce, or approximate, white (gray).

Explanation. This is nearly equivalent to Chevreul's Harmony of Contrasting Colors.

Perfected Harmony may be produced by using the required colors in about the proportions given in the following list, or it may consist of the different tones of two analogous scales that are complementary to each other. It may also be produced by using two or more analogous colors with but one color that is complementary to their general effect.

Rood calls this harmony an optical balance, and he says, concerning it, "It has been a common opinion among English writers on color, that the best result is attained by arranging the relative areas of the colors in a chromatic composition in such a way that a neutral gray would result if they were mixed together. It is quite true that, if the colors were portioned out in this manner, there would be a balance in an optical sense, though how far balance in an æsthetic sense would be attained is quite another question."

Almost every piece of color work gives the impression of some one color; it may have a slight quantity of another color mixed with it, as of blue with a little green added to it, which would make the color green blue; this, with blue or violet blue, would make the key color *blue*; the complementary of green blue is orange, and of blue, orange yellow, so that in this combination the colors to be added to produce perfected harmony will be a little of both of these colors, or a color between the two. Bradley, in his little color scheme says, "By perfected harmonies we mean those in which analogous colors are combined with the complementary of the key color, as yellow green tint, green blue shade with violet red. All those in which the effect of one analogous harmony is complementary to the effect of another."

Combinations. The colors as assorted in the list below, when used in the proportions given, will produce Perfected Harmonies. The different tones of one color of each line, with the right hue or tone of the other color of the same line, will also produce this harmony.

Red.

1. Violet Red and Green. (V. R. 70, and G. 80, or V. 29, R. 38, and G. 33.)
2. Red and Blue Green. (R. 47, B. 19, G. 34.)
3. Orange Red, Blue and Green. (O. R. 34, B. 27, G. 39.)

Orange.

4. Red Orange, Blue and Green. (R. O. 24, B. 34, G. 42.)
5. Orange, Green and Blue, (O. 23, G. 41, B. 36.)
6. Yellow Orange, Blue and Green. (Y. O. 28, B. 38, G. 34.)

Yellow.

7. Orange Yellow, Yellow and Blue. (O. Y. 21, Y. 11, G. 30, B. 38.)
8. Yellow, Violet and Blue. (Y. 46, V. 13, B. 41.)
9. Green Yellow, and Violet. (G. Y. 39, V. 61.)

Green.

10. Yellow Green, Violet and Red. (Y. G. 30, V. 40, R. 30.)
11. Green, Violet and Red. (G. 32, V. 28, R. 40.)
12. Blue Green and Red, (B. 18, G. 31, R. 51.)

Blue.

13. Green Blue and Orange. (G. B. 75, O. 25.)
14. Blue, Orange, Yellow and Green. (B. 44, O. 10, Y. 21, G. 25.)
15. Violet Blue, Yellow and Green. (V. B. 50, Y. 30, G. 20.)

Violet.

16. Blue Violet, Yellow and Green. (B. V. 50, Y. 26, G. 22.)
17. Violet, Green and Yellow. (V. 52, G. 26, Y. 22.)
18. Red Violet, Green and Yellow. (R. V. 58, G. 31, Y. 11.)

As each of these combinations produce white, (gray) when mingled, they are, theoretically perfect harmonies, still for actual use there is scarcely one of them that will produce a satisfactory effect without the addition of one or more of the neutral colors, or touches of color not given in the combinations. These additional effects are, however, allowable in any of the harmonies.

SUGGESTIONS FOR ILLUSTRATING THE HARMONIES OF COLORS.

To study the harmonies of colors with any degree of thoroughness, it will be necessary to use the various colors in harmonious combinations, and to make enough designs in colors to impress the principles of each harmony.

These combinations are most easily made by using round or square tablets, as suggested on page 43. The most simple arrangements being in rows, as shown in figure 1 below, and in figures 1 to 5 inclusive on the following page.

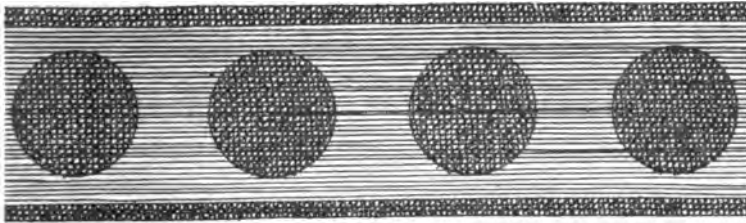


Fig. 1.

These rows may be made into border designs by mounting narrow strips of colored paper on each side of the tablets; or one of the neutral colors, black, white, gray, gold or silver may be used for a margin, or even penciled or inked lines drawn on each side of the row of tablets, will give the effect of a border.

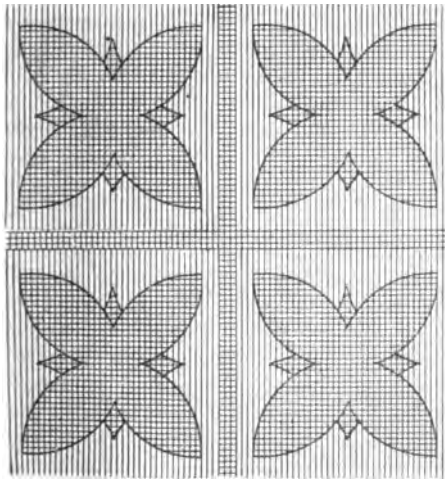


Fig. 2.

If preferred, a surface design may be made as shown in figure 2, on this page, and in figure 16, on the following page.

Any of the tablet forms previously given, or other simple figures may be used for the element of the design.

In combinations of this sort the ground color may be one of the selected colors of the combination, preferably the lighter, and the other color or colors may be mounted upon it as a design.

Simple radiating designs composed of two or more colors may also be used effectively to illustrate the harmonious combinations of colors. The circular tablets are, however, the most easily handled, and although they are not so pleasing in effect as many of the designs of more difficult construction, their use entirely avoids the general fault of beginners in designing, of over elaboration.

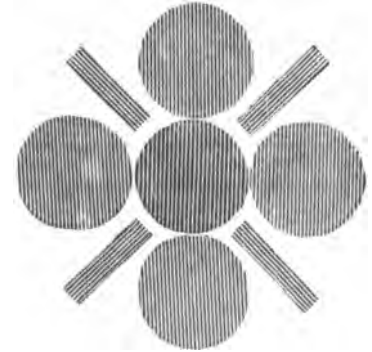


Fig. 3.

The combinations given on the following page are not intended to indicate the size of the designs, but simply some varieties of arrangement. The designs made from these suggestions should be much larger than is shown in the illustrations, and all the designs in color should be given plenty of space upon the page upon which they are mounted, so that there may be no interference with the intended effect by the close proximity of other colors. One design upon a page is usually more effective than are a number of associated

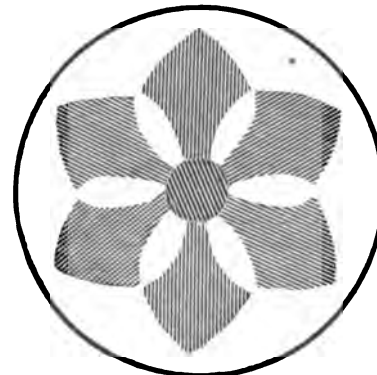
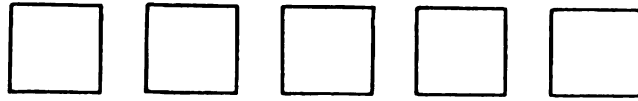


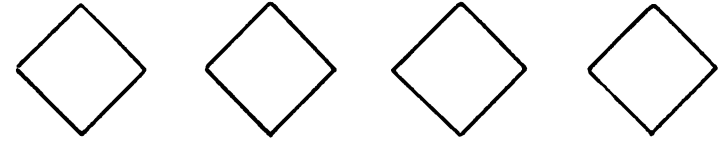
Fig. 4.

designs, unless all of the colors used upon the page are in harmony.

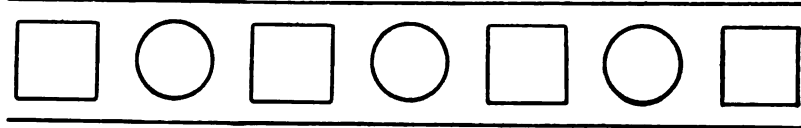
COMBINATIONS FOR ILLUSTRATING THE HARMONIES OF COLORS.



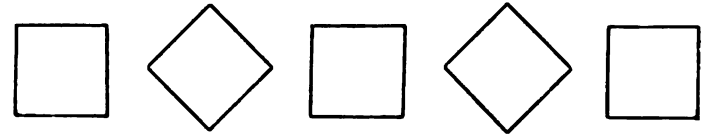
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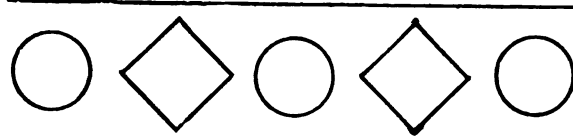
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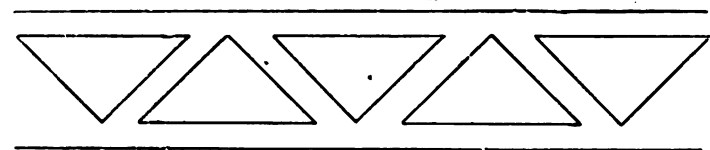
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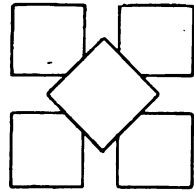
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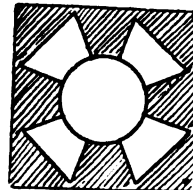
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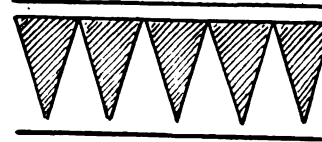
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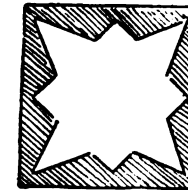
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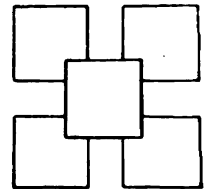
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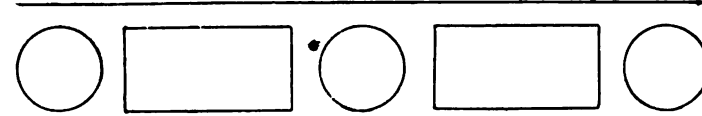
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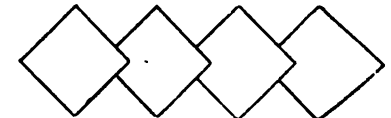
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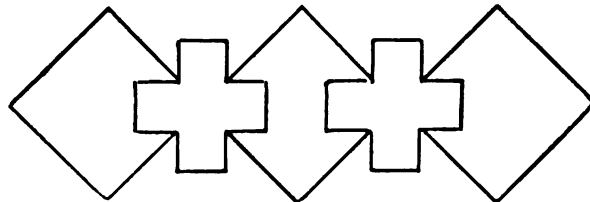
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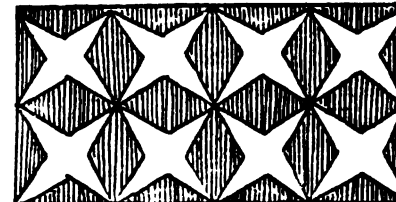
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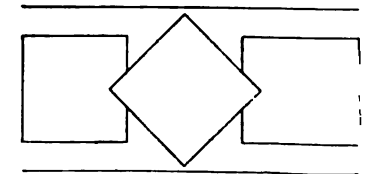
14.



15.



16.



17.

COLORS USED IN THE DIFFERENT STYLES OF ORNAMENT.

Egyptian. The Egyptians painted almost everything, and usually with good taste; their coloring, however, shows no effort to produce the effect of shade or shadow, but consists of flat tints entirely.

The ceilings of their temples were painted blue, with white or gold stars.

"Their granite, of whatever color, was tinted with a red pigment, so that the stone might have its proper divine color."

The colors used were red, blue, yellow, green, black and white.

Red and blue was a favorite combination; when yellow was used in any quantity, black was used with it to balance the effect.

The colors most generally combined on their monuments were blue, red, green, yellow and black.

Greek. The Greeks used color very generally, their earliest statues, which were made partly of wood and partly of stone, were painted. Their Doric temples, made of white marble, were painted inside and outside with the brightest colors, red, blue and yellow being the colors most generally used, with a liberal use of gold on the mouldings; when gold was not used on the mouldings the prevailing colors were red, blue and green, the green being of a very delicate bright moss color.

This combination of colors was also used: "The body of the wall a pale yellow or golden color, the triglyphs and modules blue, and metopes and tympanum red, and some other portions of the buildings green, varied in intensity as the judgment of the artist dictated."

The Greeks seem to have been the first to grade colors from light to dark, and from one color to another; previous to their time the colors were used as flat tints.

Roman. The coloring of the Romans, like their art, offered but little that was new or of excellence. "The greater part of the works of the schools of Greece, Alexandria and Asia Minor was carried to Rome by shiploads, until the number of the marble statues was said to equal that of the city's living inhabitants; and the paintings, sculpture and furniture of their palaces were either spoils of foreign states, or the work done by their slaves."

Concerning the painted decorations of the Romans, Owen Jones says: "We have not thought it necessary to give any of the painted decorations of the Romans, of which remains exist in the Roman

baths, we had no reliable material at command; and further, they are so similar to those of Pompeii; and show what to avoid than what to follow."

Byzantine. In style, the Byzantine painting was rigid in outline and excessive in coloring. The ground for their interlacing patterns was almost always gold.

The coloring inclined to gaudiness; gold, silver and other metals were often used to add to the brilliancy of the effect. The application of various colors in scroll work was optional, but for the representation of angels, saints, animals, etc., the colors were prescribed, each color having its symbolic meaning.

Red orange was often used as a ground color for black designs; the design being separated from the ground with a slight band of white.

Saracenic. Saracenic coloring was strongly marked; it was almost gaudy in effect, but was well controlled.

Red and blue was a typical combination, red for the ground, blue for the more shaded portions, and gold for the most highly raised parts. A golden yellow was sometimes used instead of gold.

In Moresque ornamentation purplish violet and yellow green were often opposed to each other. Purple, green and orange were also used for coloring delicate details.

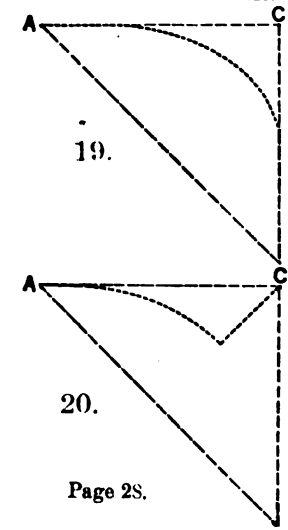
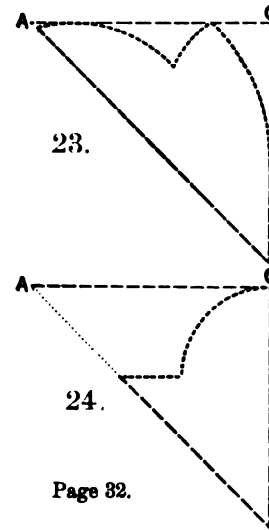
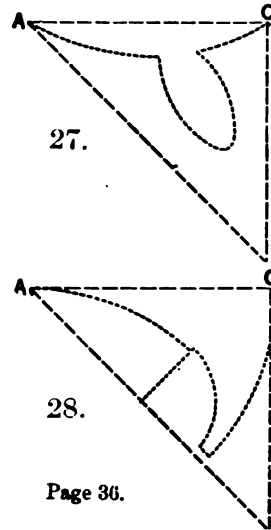
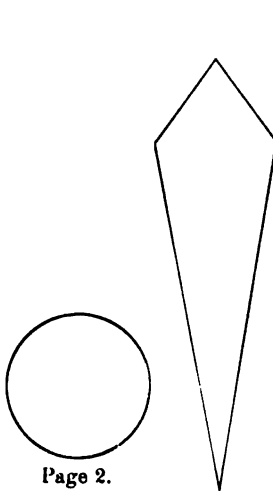
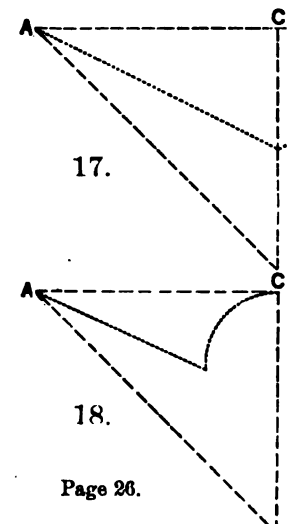
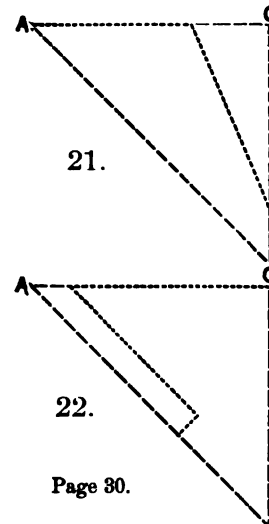
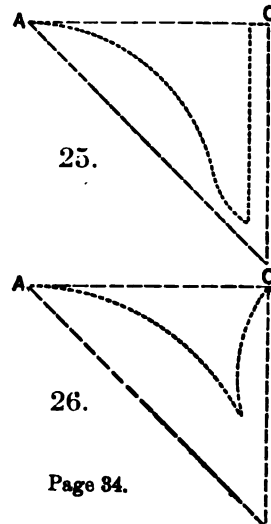
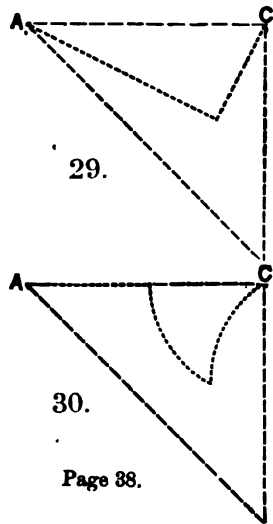
Gothic. Red and blue were favorite colors in this style of decoration, but it is more difficult to discover definite coloristic principles than in any other style, with the exception perhaps, of the Renaissance. This pair of colors has, however, succeeded in securing to itself the principal position.

Renaissance. The decorative works of Raphael, and also those of Giulio Romano, show a preference for orange, green and purple, but the Renaissance was a style of relief ornament to a great extent, and depended as much upon the effect of light and shade as it did upon the applied colors; the pure colors were, however, used in many of the decorations.

A process of decoration called sgraffito was also used for wall decorations; it consisted of coats of plaster of different colors, through which a design was cut or scraped,—a process of cameo work for walls.

SECTIONS BY WHICH TO MARK OUT THE DESIGNS.

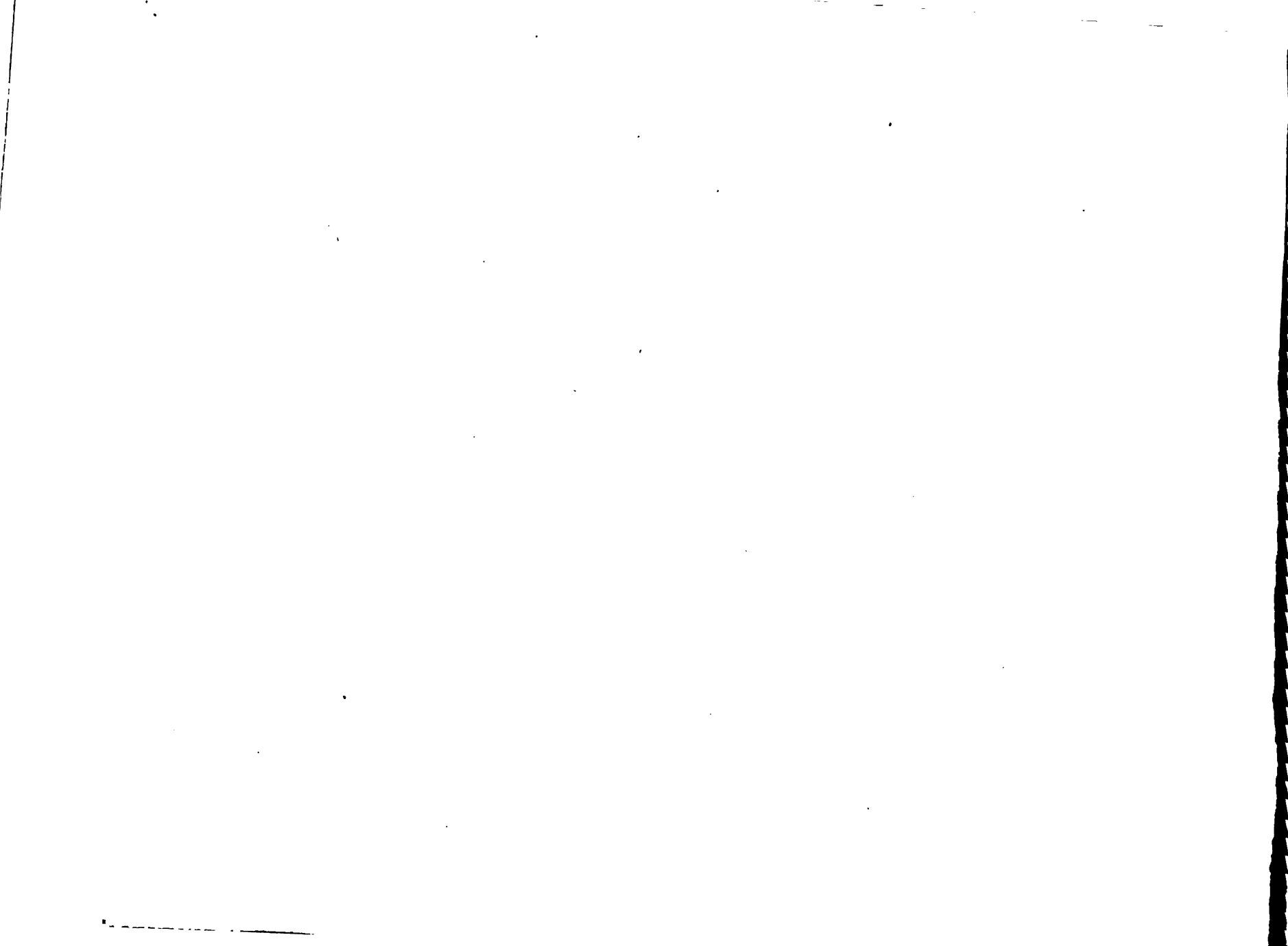
(To be cut from this page as they are needed.)



Cut the pattern out, and trace its outline upon the folded paper.

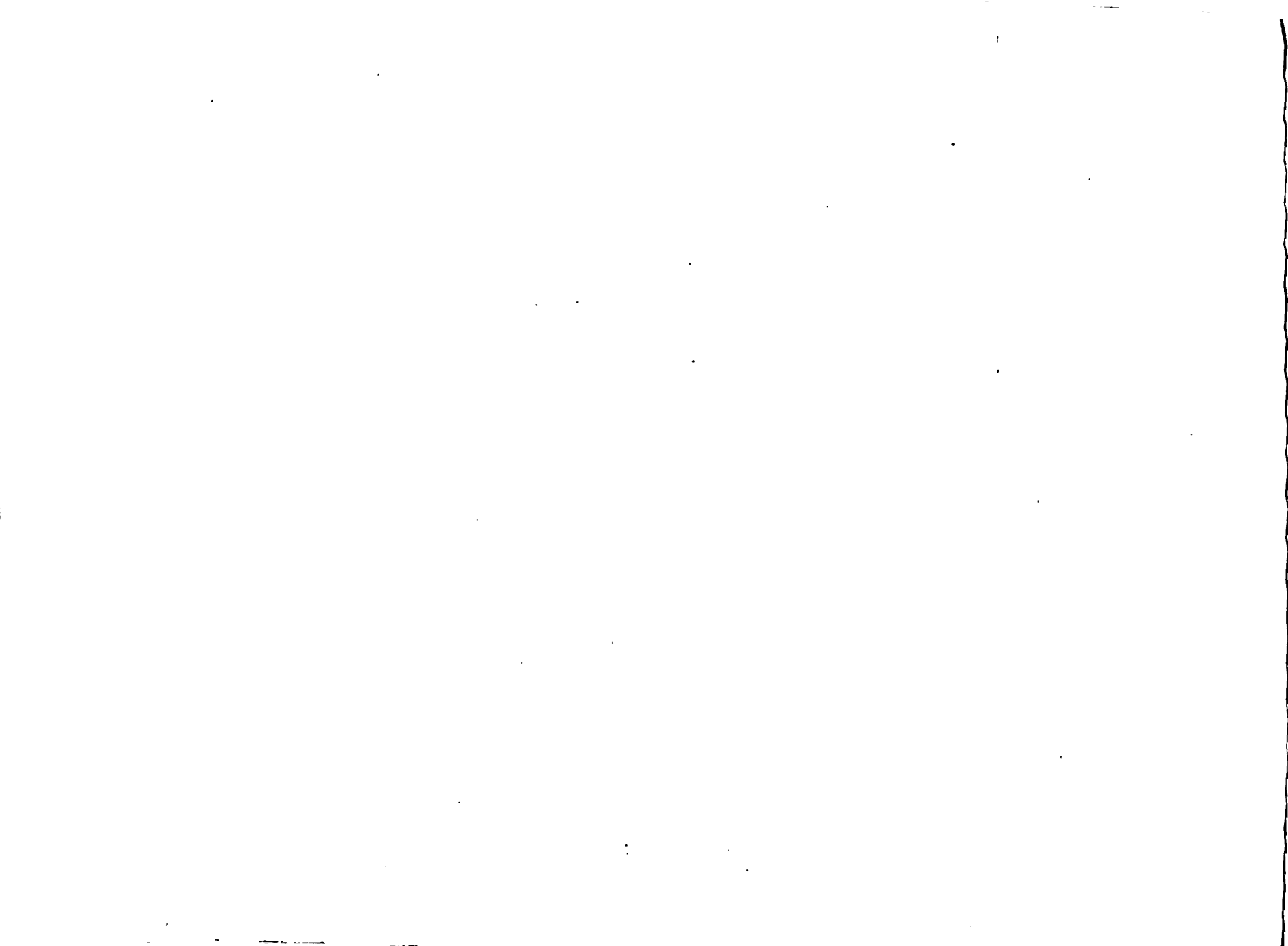
CONTRASTED HARMONY.

Contrasted Harmony is an agreeable combination of any one color, tone or hue, with white, black, gray, gold or silver.



DOMINANT HARMONY,
OR
HARMONY OF SCALE.

Dominant Harmony is an agreeable combination of colors produced by using different tones of one color.



**COMPLEMENTARY HARMONY,
OR
CONTRASTING HARMONY.**

Complementary Harmony is an agreeable combination of colors produced by using complementary or opposite colors.

**ANALOGOUS HARMONY,
OR
HARMONY OF HUES.**

Analogous Harmony is an agreeable combination of colors produced by using those colors that are related to a common basal color.



PERFECTED HARMONY,
OR
HARMONY OF CONTRASTING COLORS.

Perfected Harmony is an agreeable color effect, produced by using colors in such proportions that their admixture will produce, or approximate, white (gray).

